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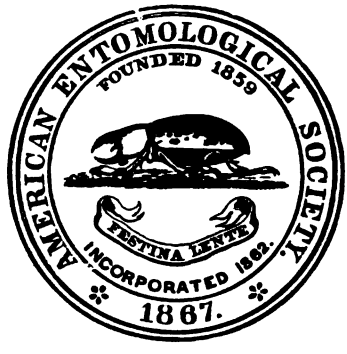

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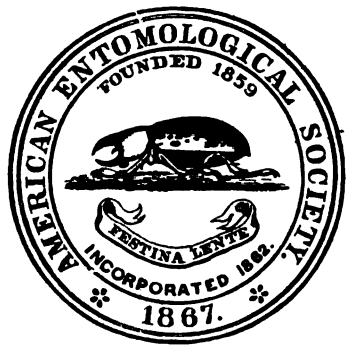

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ERRATA.

Page	6,	line	6,	*for* Centalia *read* Centralia.
"	9,	"	3,	*for* hemisperical *read* hemispherical.
"	10,	"	7,	*for* pedicle *read* pedicel.
"	11,	"	10,	*for* cauded *read* caudad.
"	11,	"	29,	*for* subacumniate *read* subacuminate.
"	14,	"	1,	*for* pedicle *read* pedicel.
"	16,	"	4 from bottom,	*for* voorvleugel 4, *read* voorvleugels.
"	18,	"	3,	for *breed* read *verbreed*.
"	18,	"	4,	for *binuen* read *binnen*.
"	18,	"	5,	transfer to bottom of page as footnote.
"	19,	"	4,	*for* closely *read* clearly.
"	19,	"	21,	*for* further *read* farther.
"	26,	"	5 from bottom,	*add* and see Hodgkiss, 1910, pp. 81, 91.
"	28,	"	7 from bottom,	for *Ceresa taurina* Fitch, *read* an unknown membracid.
"	29,	"	16,	*for* Ceresa *read* membracid.
"	29,	"	17,	*for* the same *read* an allied.
"	29,	"	22,	*for* same host *read* two hosts.
"	29,	"	22,	*for* too *read* two.
"	35,	"	3 from bottom,	*for* high *read* light.
"	38,	"	24,	*for* Viekery *read* Vickery.

[illegible] this need, even [illegible], must have [illegible] if we have to make at first a few genera based on so-called artificial characters. These can all be abolished later

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DESCRIPTIONS OF NINE NEW GENERA OF THE CHALCIDOID FAMILY TRICHOGRAMMATIDÆ.

BY A. A. GIRAULT.

(Plate I).

The descriptive matter given here is a large part of that which has accumulated during the past fifteen months while preparing a revision of the family Trichogrammatidæ and it is desirable now to get it out of the way and to have it published for other, more urgent reasons—the names of some of the species are desired for other uses and the descriptions may be delayed indefinitely by waiting for their inclusion within the revision itself; moreover the latter will be freed of much superfluous matter.

Most of the genera established here are undoubtedly good, based on distinct, stable characters but one or two of them, it seems to me, may perhaps be verging on what is called splitting; however, the value of the characters used for separation in these one or two cases will most probably hold and may even prove of higher value when more genera become known and the stability and value of such characters more definitely judgable. For the present there is pressing and greater need for better definitions of species so that they can be recognized, heretofore in the majority of cases impossible. Thus this need, even demand, must have first consideration even if we have to make at first a few genera based on so-called artificial characters. These can all be abolished later

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if necessary but for the present, to solve the correct relationships of the species of this family, we have got to be able to correctly identify them and it appears that this may mean the use of many minute characters, easy to see and apparently stable but whose value may drop to zero if interbreeding descendants of any one of the species are obtained and studied. So far these minute characters have stood that test in the case of several species.

The positions and relations of these genera will be fully discussed in the sequel, the revision.

Superfamily CHALCIDOIDEA Ashmead.

Family TRICHOGRAMMATIDÆ Foerster.

Subfamily OLIGOSITINÆ Ashmead.

1. **APHELINOIDEA** genus novum. (Figs. 1 and 2.)

Normal position.

Female.—Normal for the subfamily, resembling in general aspect some of the Aphelininæ of the family Eulophidæ, especially in the pubescence of the fore wings. Tarsi 3-jointed.

(Cephalic aspect) head rounded triangular, the eyes large and prominent, the ocelli normal, 3 in the center of the vertex, the latter broad, the lateral ocelli distant from the eye margin, the eyes with scattered pubescence; antennæ inserted below the middle of the face but slightly above (dorsad) an imaginary line drawn between the ventral ends of the eyes, 5-jointed—scape, pedicel, 1 ring-joint* and 2-jointed club, the funicle absent†, the 2-jointed club longest, cylindrical, the pedicel much longer than wide, slightly over half as long as the club.

* In some specimens, which are in a better position, apparently two distinct ring-joints but the second or distal one appears to be the rimmed proximal end of the first club joint, there being no articulation present between it and the basal club joint.

† I have stated the segmentation of the antennæ this way rather than count the joint or segment succeeding the ring-joint as funicle 1, because there is no differentiation present to represent a funicle, the two joints succeeding the ring-joint being unequal in length but forming a well defined club.

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Thorax and abdomen normal, the parapsidal furrows complete, distinct; abdomen slightly longer than the thorax, the ventral valves very slightly exserted; ovipositor not exserted. Sculpture of the body not marked. Abdomen sessile.

Fore wings not short and broadly rounded as in some genera of the Trichogrammatinæ but shaped as in many of the Aphelininæ (*Prospaltella* Ashmead), its blade being long-pyriform and gradually rounded at the apex, moderately narrow, its discal ciliation dense, normal, not at all arranged in regular lines, totally absent proximad of the distal end of the venation with the exception of a short triangular projection of it proximad along the caudal margin; marginal cilia of fore wings moderate to moderately long; fore wings deeply clouded proximad, the fumated area continuous, uniform and reaching distad slightly into the discal ciliation and slightly beyond (distad) the apex of the venation; remaining portion of fore wing hyaline. Venation of the fore wing straight, the marginal vein short, straight, clavate, stout, slightly shorter than the narrow submarginal vein which broadens slightly proximad, the postmarginal vein absent, the marginal vein apparently obliquely truncate at its apex, but in reality curving concavely caudo-distad ending in a nipple-like point to form the apex of the very short stigmal vein. Blade of the posterior wings linear, subacuminate, with three true lines of discal cilia, including the usual single row along each margin among the bases of the marginal cilia both of which are away somewhat from the margins; the marginal cilia short along the cephalic margin, longer and slenderer along the caudal margin, somewhat longer than the greatest width of the wing; posterior wings fumated proximad.

Legs normal, the distal tarsal joint slightly longer than either of the other two, tarsi *bearing a pair of tarsal claws* each, hidden from above. Mandibles with at least two equal acute outer teeth, and if a third inner (mesal) tooth is present, it is much shorter and less acute.

Male.—The same, but differing notably in the discal ciliation of the fore wing, which has a broad naked band across it

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just following the fumated area distad. The posterior wings are similarly ciliated, but the rows of cilia not extending half-way to the base of the wing blades as in the male fore wing and the proximal fumation extending only to the end of the venation. Tibial spurs single.

Type.—Aphelinoidea semifuscipennis species nova, described beyond.

A genus at once recognized by means of the 5-jointed antennæ and further characterized by the straight venation, the shortness of the stigmal vein, the normal shape and pubescence of the fore wing and the latter's striking fuscation. It may be distinguished from its nearest known ally, *Tumidiclava* Girault, by means of its slenderer 2-jointed cylindrical antennal club, the shape of the stigmal vein and the relatively more dense discal ciliation of the fore wing.

1. **Aphelinoidea semifuscipennis** species nova.

Normal position.

Female. Length, 0.65 mm. Moderate in size for the subfamily. Dark, base of the wings conspicuously clouded. General color piceous, dusky black, shining, with a purplish sheen; face dorsad, antennæ, metanotum and base of the abdomen, apex of the abdomen, distal ends of the tibiæ, proximal two tarsal joints, leg articulations and the parapsides of the thorax yellow with some duskiness, the apical tarsal joints dusky; all of the lower (ventral) aspect of face ventrad of the eyes and the antennal bulbs, cephalic aspect, piceous; caudal aspect of the head or the occipital region and portions of the vertex, dorsal aspect near the occipital margin, yellowish, the vertex with some yellowish; mandibles fuscous; eyes bright red, the ocelli darker, inconspicuous; portions of the scape and pedicel dusky, the base of the scape black. Fore wings conspicuously fumated proximad, the clouded area somewhat more pronounced or darker just caudo-distad of the apex of the marginal vein and its distal margin irregular, extending slightly into the discal ciliation, usually its center farthest advanced but sometimes its caudal third; of the blade of the wing, this clouded area forms somewhat less than a third in length and of the whole wing somewhat less than a half in length; it is broken by a narrow clear oblique streak running caudo-proximad from the end of the marginal vein and apparently cutting it off from the short stigmal vein. Venation dusky. Venter concolorous, the tip of the abdomen, however, with some yellowish.

Stigmal vein formed at first of a nipple-like prolongation of the center of the apex of the marginal vein, the caudal margin of this

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nipple running proximad and slightly caudad curving near its base disto-caudad to form a shorter, broader nipple, then from the apex of this straight proximad to form the inner (caudal) edge of the marginal vein. Sculpture of the body alutaceous, inconspicuous, combined with delicate minute longitudinal striation (balsam mounts), in reality delicate polygonal figures over the whole body, including portions of the abdomen; fore wings widest at distal fourth, the marginal cilia longest at the distal end of the caudal wing margin, there not as long as the longest marginal cilia of the posterior wing, only about as long as a seventh or eighth of the greatest wing width.

Antennæ short, moderately stout, with scattered soft pubescence. Scape cylindrical, much longer than the pedicel or the basal club joint, but not especially long or slender; pedicel long-obconic, about equal to the proximal club joint in length or slightly longer, about two-thirds the length of the scape; ring-joint distinct, short and narrow, button-like; the 2-jointed club forming about half of the whole antenna, cylindrical-ovate or spindle-shaped, its proximal joint obconic, widening distad, wider than the pedicel and about a fourth shorter than the distal joint, which is conic, truncate and broad proximad and tapering to a point; club distinct, broader than the scape and pedicel. Articulation between the two club joints not very distinct.

Male. The same as the female with the exceptions as noted under the generic description and this: the fumation of the fore wing is not broken by a narrow oblique clear streak.

From 2 male and 27 female specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

From the naked eye visible but not recognizable. Through a hand-lens (Coddington, $\frac{1}{2}$-inch, Bausch and Lomb) as previously described as concerns coloration, but when casually glanced at, appearing as if the wings were very short and triangular and black, the remaining hyaline portion not showing. The characteristics of this beautiful species are the half clouded wings and the varicolored—dusky shining black and yellow—body, especially the peculiar half and half coloration of the head.

Described from 1 male and 26 female specimens mounted in balsam, the coloration and sculpture taken from living specimens stupefied with chloroform and captured on the panes of a small window in an empty pig-shed on a farm at Centralia, Illinois, August 25 (1 ♀), 26 (1 ♂, 2 ♀'s), 29 (1 ♀), 31 (1 ♀); September 3 (1 ♀), 4 (4 ♀'s), 5 (2 ♀'s), 6

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(1 ♀) and 9 (13 ♀'s), 1909; also the specimens mentioned in the third paragraph following.

Habitat.—United States: Centralia and Urbana, Illinois.

Types.—Accession No. *41,680*, Illinois State Laboratory of Natural History, Urbana, Illinois, 1 ♂, 1 ♀ (1 slide, Centralia, August 26, 1909), 1 ♀ (1 slide, Centalia, August 25, 1909), all in xylol-balsam. *Cotype.*—Cotype No. *12,633* United States National Museum, Washington, D. C., 1 ♀ (Centralia, August 31, 1909) mounted in xylol-balsam.

Since writing the above I have obtained another female specimen captured July 8, 1910, on the glass sides of a greenhouse on the campus of the University of Illinois, Urbana, Illinois and a male captured in the same place July 27, 1910. The habits and host relations of the species are unknown. It must be common throughout the southern half of the State of Illinois.

Subfamily TRICHOGRAMMATINÆ Ashmead.

1. **TUMIDICLAVA** genus novum. (Fig. 3.)

Normal to the subfamily resembling *Aphelinoidea* Girault in general aspect; tarsi 3-jointed.

Normal position.

Female.—Head normal but rather large, bearing the ocelli in the center of the vertex distant from the eye margins, the three ocelli in a flat triangle, the lateral ocelli farther apart from each other than each is distant from the cephalic ocellus and the distance between them is slightly more than the distance between each and their respective eye margins; vertex broad; antennæ inserted some distance ventrad of the middle of the face (cephalic aspect) but distinctly dorsad of an imaginary line drawn between the ventral ends of the eyes, short and stout, capitate, the joints unequal in length and width, the club widest, short and broad rounded ovate and swollen as compared to the other joints, conspicuous but not greatly or abnormally swollen or enlarged, not much longer than broad, forming a knob at the end of the antennæ; antennæ 7-jointed, namely scape, pedicel, two minute ring-joints and a 3-jointed club immediately following,

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the funicle being absent; pedicel shortest of the three antennal regions; club distad terminating in a moderately long spur-like seta which is simple (apparently not a cluster of adhering setæ). See Fig. 3.

Thorax and abdomen normal, the latter somewhat longer than the former and ovate; ovipositor not exserted but the valves project slightly beyond the tip of the abdomen; parapsidal furrows complete; sculpture of the body normal but the segments of the abdomen, excepting caudad, are longitudinally striate. Abdomen sessile.

Fore wings as in *Aphelinoidea* Girault but the marginal fringes are slightly longer and the discal ciliation is less dense being but moderate; further, the marginal vein is less clavate and nearly uniform in width, subclavate, its distal end nearly squarely truncate, bearing from its distocaudal apex the sessile spur of a stigmal vein, which though short is distinct and knob-like and bears at its cephalo-distal margin the usual short spur-like uncus. Fore and posterior wings slightly fumated proximad, caudad of the venation. Marginal cilia of the fore wing longest at the apex of the caudal margin, shortest proximad along both margins, absent (as usual) proximad along the caudal margin opposite the venation; the longest marginal cilia are not a seventh as long as the greatest wing width. Discal ciliation irregular, absent proximad of the distal end of the venation with the exception of a few minute cilia and there is more or less of a naked area under the stigmal vein. Marginal and submarginal veins subequal; postmarginal vein absent; venation straight. Discal ciliation of the posterior wings usual, but the single row around the margins of the blade between the bases of the marginal cilia, the only rows of discal cilia present, are advanced farther than usual into the discal portion of the blade away from the margins so that they form two parallel lines of cilia near together in the cephalic half of the blade or nearly there; the caudal of these two rows has the cilia more widely separated from each other in the line; marginal cilia of posterior wings normal, longest along the caudal margin, especially at the greatest wing width

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(across the apex of the marginal vein) and shortest at the cephalic margin; posterior wings acuminate but not acute at apex.

Legs normal, the tarsal joints subequal, the posterior femora shorter and broader than the others, the cephalic coxæ largest and the trochanters 2-jointed. No strigils. Tibial spurs single; tarsal claws present but concealed from dorsal aspect and turned back upon themselves.

Male.—Unknown.

Type.—*Tumidiclava pulchrinotum* species nova, described beyond.

As stated, a genus closely allied with *Aphelinoidea* but differing from that genus in the wing and antennal characters pointed out. The type species is described herewith.

1. **Tumidiclava pulchrinotum** species nova.

Female. Length 1 mm.; normal in size for the subfamily; easily visible to the naked eye. General color opaque black. Varicolored, black and yellowish; eyes and ocelli dark garnet; face, thoracic venter, coxæ, flagellum, scutellum, median line of mesoscutum, its caudal fourth and the caudal halves of its lateral margins, mesopostscutellum, metanotum and caudal margins of pronotum (narrowly) all dusky yellow, the yellow pattern on the mesoscutum forming against the black background of that sclerite an anchor-shaped figure, the shank of which is the median line of the mesoscutum; tegulæ pallid yellow; scape of the antennæ nearly black; legs concolorous with the abdomen with the exception of the articulations, trochanters, mesal aspects of the tibiæ and proximal two tarsal joints which are dusky yellow; fore wings hyaline, excepting proximad where, caudad of the venation, they are slightly clouded or fumated; the posterior wings are less distinctly fumated in the same place; venation dusky yellow.

Sculpture of the body very fine, inconspicuous, excepting that of all of the abdominal segments (excluding the discal 2) which bear fine longitudinal striæ, the distal or caudal two segments finely sheened. Pubescence on the body inconspicuous.

Antennæ short, the scape and pedicel normal, the former cylindrical, not much longer than the latter and subequal to the club in length; scape not reaching up to the vertex; pedicel obconic, longer than wide, about two-thirds the length of the club; ring-joints minute and narrow, very much wider than long; club abruptly larger, rounded-ovate, widest at its proximal third or at the apex of its second joint, subacutely pointed and terminating in a colorless spine-like seta, thrice

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wider than the scape or pedicel and as long as the former, 3-jointed, its proximal joint not more than a fifth the length of the distal joint, hemisperical, rounded proximad and nearly truncate distad, wider than long; the intermediate joint transverse, widest, both joints together not as long as the large terminal joint; distal club joint subequal in length to the pedicel, or somewhat longer, conic, longer than wide. Pubescence of antennæ normal, sparse, the hairs long and soft (fig. 3).

From 3 specimens. ⅔-inch objective, 1-inch optic, Bausch and Lomb.

Described from three female specimens stupefied with chloroform and then mounted in balsam, the coloration and sculpture taken from the specimens while yet alive. Two of these specimens were captured from the same window-pane as the other specimens taken at Centralia, Illinois, on September 9, 1909; the third by sweeping in a meadow, Urbana, Illinois, June 8, 1910. The characteristics of this beautiful species are the yellow anchor-like figuration on the mesoscutum, the yellow scutellum, flagellum and face. In balsam mounts, the antennæ become transversely wrinkled so that the true segmentation is liable to be obscured, the club appearing to be less than 3-jointed; the coloration is also somewhat obscured but the ring-joints are barely visible unless mounted in some medium.

Habitat.—United States: Centralia and Urbana, Illinois.

Type.—Type No. *13,390*, United States National Museum, Washington, D. C., 1 ♀ in xylol-balsam (Centralia, Illinois, September 9, 1909). *Cotype.*—Accession No. *44,162* (1 ♀ in xylol-balsam, 1 slide, Urbana, June 8, 1910), Illinois State Laboratory of Natural History, Urbana, Illinois.

2. **ABBELLA** genus novum. (Figs. 4 and 5.)

Normal to the subfamily, the discal ciliation arranged in regular rows, but yet evidently allied with *Oligosita* Westwood and *Westwoodella* Ashmead, the venation and wings similar in many details, the antennæ very similar and the general habitus similar. For the present, therefore, I emphasize its similarity to these two; it has an additional funicle joint and different wing ciliation. It is also somewhat similar to *Ittys* described beyond.

Normal position.

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Female.—Head normal, the three ocelli in the center of the vertex in a triangle, the lateral ocelli distant from the eye margins; eyes naked; antennæ inserted near the ventral ends of the eyes, very near the middle of the face, 8-jointed — scape, pedicel, 1 ring-joint, a 2-jointed funicle and a 3-jointed club; antennæ somewhat more compact than in *Westwoodella* but otherwise very similar, the pedicle distinctly much longer than the small, compact funicle, two-thirds the length and size of the long ovate club, the scape obclavate; second funicle joint short (Fig. 4).

Thorax normal, the parapsidal furrows complete. Abdomen sessile, the ovipositor not exserted. Tarsi 3-jointed, the joints increasing in length distad, none of them especially long, the tarsal claws absent or else concealed. Tibial spurs minute, acute, single, the anterior ones not curved and forked, the strigil absent. Sculpture of the body inconspicuous. Legs normal.

Fore wings (Fig. 5) shaped as in *Trichogrammatoidea* Girault,* moderate in width and regularly, convexly rounded distad, the marginal cilia long but by far not so long as in *Oligosita* and *Westwoodella*, gradually lengthening distad on both margins but somewhat more quickly so on the caudal margin, the discal ciliation in regular longitudinal lines (these confused in denser places) and moderately long, distinctly separated cilium from cilium, erect, variable in density but never dense; the submarginal and marginal veins straight, long, unequal, the stigmal vein short, uniform in width, merely a rounded ovate knob attached to the end of the marginal vein nearly at right angles; substigmal fuscous spot present, prominent. Posterior wings narrow, hyaline, with regular discal ciliation—a single long longitudinal row of them in the disk, near caudal margin, in addition to the two lines of ciliation around the edges of the disk between the marginal cilia.

Mandibles dentate, the dentation unknown, but at least tridentate.

Male.—The same, secondary sexual characters being pres-

* Described beyond.

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ent in the abdomen alone, which is plump, regularly ovate, the genitalia sometimes exserted in death.

Type.—*Abbella subflava* species nova, described beyond.

1. **Abbella subflava** species nova.

Female. Length, 0.65 mm.; moderate in size for the subfamily; variable. General color pale lemon yellow; pedicel and basal club joint of the antennæ distinctly darker, almost dusky; dorsal and ventral aspects of the scape dusky, but variable; lateral aspect of the thorax marked with dusky, forming an interrupted and broken rectangular dusky area involving the whole lateral aspect of the thorax and extended cauded along the abdomen in the shape of a spot on each segment in the dorso-lateral aspect, forming a broken longitudinal line on each side; a dusky line obliquely across ventral ends of the eyes, paler at the eye apex; legs paler, the distal tarsal joint as usual darker; scape paler, concolorous with the legs. Eyes and ocelli bright red. Wings hyaline, with the exception of a conspicuous substigmal fuscous spot of the fore wings which is about three times the size of the stigmal knob and oval in shape. Venation pallid yellowish. Ovipositor concolorous, not exserted.

Sculpture of the body very delicate, opaque. Abdomen conic-ovate as long as the head and thorax combined. Fore wings not short and broad, moderately narrow, but not as narrow as in the genus *Westwoodella*, moderately, loosely pubescent, the cilia soft, consisting of about from 8 to 14 longitudinal lines counting across the widest part of the wing; marginal cilia moderately long, longest at the apex, but there not longer than a fourth of the greatest wing width; venation straight, the postmarginal vein absent, the stigmal vein short, sessile, ovate, turned nearly at right angles to the marginal vein as in *Westwoodella*. Blade of posterior wings subacumniate, the marginal fringes of the posterior margin very long, those of the cephalic margin short; in the blade, in addition to the row of cilia along the margins arising from the surface, there is a single long complete longitudinal row in the disk of the wing nearer the caudal margin. Fumated substigmal spot of fore wing with its axis directed proximo-caudad from the stigmal vein. Lateral ocelli much more than their own width distant from the eye margin, the ocelli in a nearly equilateral triangle.

Antennæ loosely, softly pubescent, the hairs moderately long and sparse. Scape cylindrical, obclavate, subequal to the club in length; pedicel obconic, much longer and wider than the funicle joints combined, longer than any of the joints of the club taken singly but not much longer than half the length of either the club or scape, about two-thirds the length of either the scape or club, moderately stout, at least twice longer than it is broad at apex; ring-joint minute, distinct; joint 1 of funicle hemispherical, its apex truncate, somewhat obliquely

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so, nearly twice the size of the second funicle joint, which is small like a ring-joint and transverse; funicle narrower than the pedicel and club the second funicle joint distinctly longer and wider than the ring-joint, but the whole small funicle barely longer than the proximal club joint. Club ovate, somewhat broader than the pedicel, its proximal joint obconical, truncate at apex, the intermediate joint slightly longer, obliquely truncate, the widest point of the club being the line between the first and second joints; terminal joint conical, narrower, not ending in a prominent spine. Pubescence more thick on the distal club joint than elsewhere, there being somewhat grouped but not projecting, the broad setæ appearing as longitudinal ridges or corrigations.

From 16 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—The same with the secondary characters as pointed out in the generic description and with the setæ of the terminal club joint slenderer, more scattered and projecting beyond the tip but not in the form of a spine. (Fig. 4, male antenna.)

From 9 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Described at first from two female specimens mounted in balsam and captured on the panes of a window in an empty pig-shed on a farm at Centralia, Illinois, August 25, 1909, and from two male specimens in the collection of the United States Department of Agriculture on two slides labelled as as follows: "W. 3969. *Trichogramma* sp. from jassid eggs. Pullman, Washington." Sculpture and coloration from the two females, taken when alive, partly stupefied with chloroform. I have since captured a single female on a window in a stable at Litchfield, Illinois, July 13, 1910; and see beyond.

Habitat.—United States: Centralia and Litchfield, Illinois; Pullman, Washington; Washington, D. C.

Types.—Type No. *13,397*, United States National Museum, Washington, D. C., 6 ♂'s, 12 ♀'s in xylol-balsam (1 slide); formerly in National Museum collection mounted on tags and labelled "Trichogramma ? minuta Riley, Washington, D. C." *Cotypes.*—Accession Nos. *41*, *683* (1 ♀ in xylol-balsam, Centralia, Illinois, Aug. 25, 1909, Girault; mounted with a single female of *Pentarthron minutum* Riley), *44,163* (1 ♀ in xylol-balsam, Litchfield, Illinois, July 13, 1910, Girault) and *44,164* (1 ♂ in xylol-balsam, Pullman, Wash-

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ington, W. 3969), Illinois State Laboratory of Natural History, Urbana, Illinois.

I have also found in the National Museum collection a series of 6 ♂'s and 12 ♀'s mounted on tags (now remounted in balsam) and labelled "*Trichogramma* ? *minuta* Riley, Washington, D. C."; and three tagmounted specimens in the same collection labelled "3756°. *Trichogramma* on Heteropterous eggs? Issued Sept. 10, 1885." These were 1 ♂, 2 ♀'s and have also been remounted in balsam. The former have been designated as types.

2. **Abbella acuminata** (Ashmead).

Trichogramma acuminatum Ashmead (1888), described years ago belongs to this genus. It will be fully redescribed later.

3. **TRICHOGRAMMATOIDEA** genus novum. (Figs. 6 and 7.)

A genus closely allied with and resembling *Pentarthron* Riley, but differing from it in having slightly narrower fore wings which lack the short oblique line of discal cilia running proximo-caudad from the stigmal vein and which have longer marginal cilia, especially distad, somewhat as in *Oligosita* Haliday of the other subfamily but not so long. Further than these, the male antennæ are distinctly segmented, not nodular, 8-jointed and the antennæ of both sexes, in the type species at least*, bear peculiar, minute bladder-like appendages on the funicle joints which have not as yet been found to occur in any other genus.

Normal position.

Female.—Head normal, the eyes prominent, ovate, the ocelli in a curved line on the vertex, the lateral ocelli not touching the eye margins, at least their own width from them, the head wider than the thorax; antennæ (fig. 6) inserted ventrad of the middle of the face, 6-jointed as in *Trichogramma* Westwood and *Pentarthron* Riley—scape, pedicel, ring-joint, two funicle joints and a solid club; scape moderate in length, cylindrical, somewhat convexed ventrad, subequal to the club in length and somewhat longer than the

* I have since found them on *lutea*, the second species of the genus.

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pedicle, single ring-joint and funicle combined; pedicel somewhat longer than the funicle, distinctly longer than either of the funicle joints taken alone; funicle joints subquadrate, subequal, wider than long. Thorax shorter than abdomen, the parapsidal furrows complete, the mesoscutum largest, its caudal margin not straight, the cephalic margin of the scutellum acute at the meson; abdomen cylindrical, about equal to the head and thorax combined, as in *Pentarthron* Riley. Ovipositor not exserted, the valves short, non-prominent, as in *Pentarthron*.

Fore wings moderately narrow, regularly rounded, the margins of the blade distad similar, the marginal fringes moderately long, about from a fourth to a fifth of the greatest wing width and at least twice longer than in *Pentarthron*, the discal ciliation moderate, about from 10 to 14 longitudinal lines, some of which are short; venation forming a regular bow as in *Pentarthron*, the submarginal vein very long, the marginal shortest, stoutest, the stigmal vein distinctly longer than the marginal and forming the longest arm of the bow, its knob rounded and distinct, the uncus small. Postmarginal vein absent. Posterior wings narrow, acute at the distal end of the marginal vein, bearing one principal longitudinal line of discal cilia, the lines along the edges of the disk absent; the marginal ciliation normal.

Tarsi 3-jointed, the joints moderate in length, simple; tibial spurs all single, all straight, moderate to small. Tarsi without claws, apparently. Sculpture of the body not conspicuous. Pubescence of antennæ as in *Pentarthron*, not conspicuous as in the other sex.

Male.—The same; antennæ (fig. 7) with conspicuous single long setæ, like pine leaves, on the funicle and club joints, cylindrical, with eight distinct joints, the scape and pedicel as in the female, the four funicle joints subquadrate to rectangular and not unlike the club joint which, however, is somewhat conical. The abdomen is somewhat shorter and more rounded. The articulation between the club and fourth funicle joint is less defined than that between the other funicle joints, sometimes not seen without the aid of high

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power. The marginal fringes of the fore wings have a general tendency to be longer than is the case with the female.

Description based on specimens of the type species sent to Dr. L. O. Howard by Zehntner hence metatypes, perhaps paratypes.

Type.—Chaetosticha nana Zehntner.

1. **Trichogrammatoidea nana** (Zehntner).

Chaetosticha nana Zehntner, 1896, pp. 14–16, Pl. I, Figs. 9–11.

The original description of the species follows, together with a condensed free translation of it and additional descriptive notes made from the specimens kindly loaned to me by Dr. Howard mentioned previously.

b. CHAETOSTICHA*) NANA n. sp.

Pl. I. fig. 9–11.

Beschrijving van den Parasiet.

De grondkleur van het *lichaam*, de sprieten en de pooten, zijn lichtgeel; het laatste tarsaallid is bruin, de oogen en bijoogen bloedrood, de eerste borstring bruinachtig, het schildje van den tweeden borstring en een dwarsche streep op iedere achterlijfsring grauwgeel; de voorvleugel in het gebied van de costaalader roodbruin, de rest kleurloos zooals de achtervleugels. De grauwgelekleur ontbreekt dikwijls op den rug der middelste achterlijfsringen.

De sprieten zijn rechthoekig gebogen, bij beide geslachten zevenledig. *Bij het wijfje* (Pl. I. fig. 10) is het eerste lid zoo lang als de 5 volgende te zamen en met enkele haren bezet. Het tweede lid is half zoolang als het eerste, aan de basis sterk versmald en van eenige tamelijk lange haren voorzien. De leden 3 en 4 zijn buitengewoon klein, sterk samengedrukt; het derde lensvormig, het vierde wigvormig. Ze zijn niet in iederen stand van de sprieten te zien en kunnen daarom gemakkelijk over het hoofd gezien worden. De leden 5 en 6 zijn iets breeder dan lang, echter niet breeder dan het tweede lid. Bij enkele individuen zijn deze beide leden slechts onvolkomen gescheiden. Ieder draagt een blaasvormig gevoelsorgaan (s). Het zovende lid bedraagt 25 van de geheele lengte der sprieten. Het is veel breeder dan voorafgaande geledingen, in het midden het breedst, naar het einde spits toeloopend en aan de zijden samengedrukt. Zijn bovenste rand is recht, lamellair, en van twee tandjes voorzien, zijn onderste rand gebogen. Het geheele lid is dicht en kort behaard, met enkele langere haren daartusschen.

* Op plaat I bij vergissing "Trichogramma."

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De sprieten *van het mannetje* (Pl. I. fig. 11) zijn iets langer dan die *van het wijfje*. Het eerste lid is slanker dan *bij het wijfje*, zoolong als de drie volgende te zamen, en met enkele haren bezet. De lengte van het tweede lid bedraagt 2 5 van die van het eerste, het is aan de basis sterk versmald. De leden 3 tot 6 zijn iets breeder dan het tweede lid, onderling even breed, en alle hebben van ter zijde gezien een vijfhoekige gedaante, omdat hun bovenste rand onder een stompen hoek voornitspringt. Elk der geledingen 3 tot 6 is van 5 lange, stevige, gekromde, stijve haren voorzien, die vermoedelijk gevoelszintuigen zijn, en welke aan de sprieten een vreemd uiterlijk geven. Wat de lengte betreft, zoo zijn de geledingen 3 en 6 onderling gelijk, het 4e lid iets korter, het vijfde iets langer dan 3 en 6. De geledingen 3, 4 en 5 zijn behalve van de lange, stijve haren, ook nog van blaasvormige sensitieve organen (s) voorzien op het 6e lid schijnen deze te ontbreken. Het zevende lid is zoolang als het 5e en een weinig smaller dan dit, aan het einde smaller toeloopend. Zooals de 4 voorafgaande geledingen is het met lange stijve haren bezet, die minstens acht in getal zijn. Op den top van het lid bevindt zich bovendien nog een blaasvormig sensitief organ (s).

De pooten zijn onderling ongeveer even dik. Alleen de dij van het derde paar is een weinig verdikt.

De schenen zijn aan het einde met een korte spoor gewapend.

De tarsen zijn vierledig.

De voorvleugels aan het einde tamelijk verbreed; verbreed afgerond de voorrand naar binnen gebogen. De costaalader treedt slechts op een punt in den voorrand van den vleugel en draagt op de distale helft 4 rechtopstaande haren. De tak van de costaalader is aan het einde verbreed, en zwak gespleten. Het niet rookkleurige deel der vleugels is met korte, in overlangsche rijen gerangschikte haartjes bezet en de respectieve vleugelranden zijn door een krans van lange haren omgeven.

De achtervleugels zijn zeer smal lancetvormig, in het midden van den voorrand met een vooruitspringende punt. De oppervlakte is van een enkele overlangsche rij van korte haartjes voorzien. De vleugelranden zijn met lange haren bezet, uitgezonderd op het basale derde gedeelte.

Bovenkaak vierhoekig, naar de spits toe zeer weinig versmald, aan het einde van 4 a 5 stompe tandjes voorzien.

Onderkaak en *onderlip* met eenledigen taster, ledere taster met een kort onder den top staand stijf haar.

Lengte van het lichaam .....0,55 mM.
" " den voorvleugel..4.....0,38 mM.

(Mededeelingen van het Proefstation Oost-Java. Nieuwe Serie No. 23, pp. 14–16.)

The preceding description may be translated as follows:

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The ground color of the body, antennæ and legs is light yellow; the distal tarsal joint is brown, the eyes and ocelli ruby red, the pronotum brownish; the shield of the mesonotum and a transverse streak upon all of the abdominal segments grayish-yellow; the fore wings reddish-brown in the region of the costal vein, the rest colorless like the posterior wings. The grayish yellow color occurs frequently upon the middle of the back of the abdominal segments.

The antennæ are bent at right-angles, in both sexes 7-jointed. In the female (plate I, fig. 10) the first joint is as long as the five following combined and is armed with simple (*enkele*) setæ. The second joint is half as long as the first, at the base strongly narrowing and provided with several tolerably long setæ. Joints 3 and 4 are extraordinarily small, strongly pressed together; the third lens-shaped, the fourth wedge-shaped. In all aspects of the antennæ they are nothing to see and know and therefore easily overlooked. Joints 5 and 6 are somewhat wider than long, yet not any broader than the second joint. In several specimens both of these joints happen to be imperfect. Each bears a bladder-shaped organ of sensation (s). The seventh joint amounts to .25 (?) of the whole length of the antennæ. It is much wider than the preceding joints, widest at its middle, near the end terminating in a point and compressed at the sides. Its uppermost edge is straight, lamellate (*lamellair*), and provided with two teeth, the lower edge curved. The whole joint is covered with close, short hairs with several long hairs between.

The antennæ of the male (plate I, fig. 11) are somewhat longer than those of the female. The first joint is slenderer than in the female, as long as the three following joints combined and clothed with simple setæ. The length of the second joint amounts to two-fifths (?) of that of the first and it is strongly narrowed at the base. Joints 3 to 6 are somewhat wider than the second joint, reciprocally equal in width and in outline, all show a pentagonal form because their upper side is produced from an obtuse angle. Each of joints 3 to 6 have five long, stiff, curved setæ, which apparently are organs of sensation, and which give to the antennæ a singular appearance. Concerning length, joints 3 and 6 are mutually equal, the fourth joint somewhat shorter, the fifth somewhat longer than 3 and 6. The joints 3, 4 and 5 are provided, besides the long stiff setæ, in addition with bladder-shaped sensitive organs (s) but on the sixth joint these appear to be missing. The seventh joint is as long as the fifth and a little narrower, at the end narrower, ending in a point. Like the four preceding joints it is clothed with long, stiff setæ, which are at least eight in number. Upon the tip of the joint there is, moreover, a bladder-shaped sensitive organ (s).

The legs are reciprocally about equally thick. Only the femur of the third pair is a little thickened.

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The tibiæ at the tips are armed with a short spur.

The tarsi are four-jointed.

The fore wings at the apex tolerably broad; *breed afgerond de voorrand naar binuen gebogen.** The costal vein runs merely to a point in

* I was unable to translate these words.

the cephalic margin of the wing and bears upon the distal half four erect setæ. The branch of the costal vein is broadened at the tip and weakly split. The "faintly" smoky-colored part of the wings is clothed with short cilia disposed lengthwise and the respective wing margins are surrounded or enclosed by a fringe (*krans*) of long cilia.

The posterior wings are narrow lancet-shaped, with a projecting point in the middle of the cephalic margin. The upper side is provided with a single longitudinal row of short cilia. The wing margins are clothed with long cilia except on the basal third portion.

Mandibles quadrangular, towards the end exceedingly narrow, at the apex provided with from four to five blunt teeth.

Maxilla and labium with 1-jointed palpi, the palpi with a short, erect, stiff seta beneath their tip.

Length of the body.....0.55 mm.
Length of the fore wings.....0.38 mm.

As indicated in the footnote referring to the plate, there by mistake the legend read *Trichogramma* instead of *Chaetosticha*.

Additional descriptive notes:

The coloration is quite as described but the ground color is variable sometimes decidedly dark yellow, The fumation of the proximal halves of the fore wings is variable in depth or density, sometimes pronounced, especially in the females but usually not very dense and in individuals uniform. Neck of the stigmal vein slender, graceful. The tarsi are not 4-jointed as described and the female does not have two ring-joints in the antennæ as plainly indicated in the description though not shown in the figure whereas the male has a single ring-joint as in the female, hence the male antennæ are 8-jointed, those of the female 6-jointed; hence in the case of the female an additional joint was erroneously accepted while in the male one was overlooked. The fumation of the fore wing extends distad to the end of the stigmal vein, its distal margin nearly straight; the discal ciliation of the fore wing extends proximad in a broken line to a point opposite the base of the stigmal vein. The marginal cilia of the caudal margin of the posterior wings are about equal in length to the longest marginal cilia of the fore wing or somewhat shorter and are distinctly longer than the caudal wing is wide, There are four prominent setæ borne by the venation as mentioned in the description, a distal two borne by the marginal vein and the other two along the distal end of the submar-

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ginal vein. The distal end of the submarginal vein and the marginal vein are stouter than the remaining portions of the venation. Indications of the bladder-like appendages of the funicle joints present but not closely defined in the specimens at hand; minute. Size of body moderate to small for the group, visible to the unaided eye.

These descriptive notes were made from a slide bearing the following labels and sent by Zehntner to Dr. L. O. Howard, who loaned it to me for study: "Chaetosticha nana Zehntner. 7 ♀'s; 3 ♂'s. Aus Diatraea striatalis eiern. (Java)" and "7345." The slide bears in reality 2 ♂'s, 2 ♀'s of *nana* and 1 ♂, 5 ♀'s of a larger species, an apparently undescribed species of *Pentarthron* Riley*. The first label is in the handwriting of Zehntner.

2. **Trichogrammatoidea lutea** species nova.

This species is closely related to *nana* but can be separated from it by observing the differences in length between the marginal cilia of the fore wing and those of the caudal margin of the posterior wings. In *nana* those two sets of cilia are about equal, whereas in *lutea* the cilia of the caudal wings are distinctly longer than those of the fore wing distad. The fore wings in *lutea* are also fumated less further distad, only to the middle of the marginal vein and are distinctly broader in relation to their marginal cilia, the latter being only about a fifth as long as the greatest wing width. The knob of the stigmal vein is also different in this species, being less rounded, more ovate.

Normal position.

Female.—Length 0.85 mm. Larger than *nana*, visible to unaided eye. General color orange-yellow, marked with dusky, the eyes and ocelli carmine, the proximal half of the abdomen and cephalic third of the thorax dusky; tegulæ dusky yellow; antennæ and venation dusky yellowish, the scape paler, the legs pallid yellowish with the exception of the darker tarsi. Wings hyaline, the fore wings, however, distinctly, not pronouncedly, fumated proximad, the fumated area extending distad only as far as the middle of the marginal vein, its distal margin oblique, caudo-distad. Mandibles apparently with five teeth. Parapsidal furrows complete; abdomen cylindrical, about equal in length to the head and thorax combined. Ovipositor not exserted, the valves not prominent.

* Now known to be *minutum* (Riley).

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Fore wings regularly rounded, moderate in width, the marginal fringes gradually lengthening distad, there moderately long but distinctly not as long relatively as in *nana*, about a fifth as long as the greatest wing width, absent on both margins proximad of the distal end of the marginal vein, very much longer than the discal cilia. The latter are arranged in about from 12 to 15 longitudinal lines and are absent proximad of the distal end of the stigmal vein excepting for a small, irregular group of about 6 to 8 which projects proximad from the main group of cilia; the longest distal marginal fringes of the fore wing is distinctly shorter than the longest fringes of the caudal margin of the posterior wing, about a third shorter. Discal ciliation of the fore wing moderately short, distinct, in regular lines.

Posterior wings narrow, acute at the distal end of the submarginal vein along the cephalic margin or at the hooklets, the blade not acutely pointed, the two margins not parallel or similar, the marginal cilia of the cephalic margin moderately long to short, not short but very much shorter than those of the caudal margin which are very long, very much longer than the blade is wide and about twice as long as the greatest width of the blade. Discal ciliation consisting of a single longitudinal line of cilia running from the marginal vein to the apex, nearer the cephalic margin, the cilia near the apex much farther apart in the line and the line not reaching the apex. Sometimes a single seta is present caudad of the principal line of cilia, near its base as though representing a second line now obsolete. The usual line of discal cilia along the edges of the blade between the insertions of the marginal cilia absent.

Venation of the fore wing forming a regular bow whose longer arm is the stigmal vein; submarginal vein longest by far, thickening at its distal third, the marginal vein thickest and shortest, but comparatively not much shorter than the slender stigmal vein which bears an ovate club or knob bearing a slight uncus; the knob forms not quite a half of the length of the whole vein; marginal vein less than one-half as long as the stigmal vein; the marginal vein bears two conspicuous setæ about equally long, another similar seta being borne by the submarginal vein at its distal end.

Antennæ 6-jointed, the scape moderately long, cylindrical, subequal to the club in length and somewhat longer than the pedicel, ring-joint and the two funicle joints taken together; pedicel obconic, about half the length of the scape, narrow proximad; the ring-joint narrow, distinct; the funicle joints subequal, subquadrate, slightly wider than long, about subequal in width to the apical end of the pedicel, the first funicle joint somewhat the larger, somewhat wider and longer; the solid club about three and one-fourth times longer than wide, the

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largest joint, somewhat longer than the scape and much wider, cylindrical ovate. Pubescence of antennæ very sparse, a few scattered setæ. (Two bladder-like appendages, one on each funicle joint in the lateral aspect quite as figured for *nana* but their petioles more distinct; minute—on one specimen.)*

Legs simple, tibial spurs single, straight.

From 11 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—The same, somewhat lighter in color, the abdomen similar, the genitalia somewhat similar. Antennæ very different, distinctly 8-jointed and cylindrical, the club not differentiated and the flagellum bearing long single conspicuous setæ. Scape and pedicel about the same, somewhat shorter; ring-joint the same; the four funicle joints pentagonal, subquadrate, subequal, the third being largest; the club joint as long as the preceding joint but narrower, obtusely conical. Each funicle joint bears four or five of the long setæ in an irregular whorl, the club joint several more. These setæ are curved. (No bladder-like appendages on these specimens.)*

From 3 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Described from three males and eleven females† received for study from Dr. L. O. Howard, Chief of the National Bureau of Entomology, in two lots as follows, all mounted in balsam: Lot I.—Two slides labelled "From eggs of Codling moth, Cape Town, S. A., 25 Jany., 1910. C. P. Lounsbury," and bearing four females and three males, one female respectively.† Lot II.—"Egg parasite of *Carpocapsa* sp.? Natal, 20–3–01. Claude Fuller," and bearing four females and two females respectively (two slides).

* These minute appendages resembling somewhat a ball on the end of a short rod are evidently quite easily broken off, hence their absence in the majority of the specimens.

† Since writing this, through the kindness of Dr. L. O. Howard I have examined three more slides of this species, belonging to Lot I, similarly labelled and each bearing 4 ♀'s; two of these slides were labelled 26 January, 1910, instead of the twenty-fifth. Hence a total of 26 specimens have been examined.

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The species is parasitic on *Carpocapsa pomonella* Linnæus in South Africa.

Habitat.—South Africa: Cape Town; Natal.

Types.—Type No. *13,392*, United States National Museum, Washington, D. C., 3 ♂'s, 1 ♀ in xylol-balsam, one slide (Cape Town, South Africa, 25 January, 1910, Lounsbury). *Cotypes.*—Accession No. *44,167* (4 ♀'s in xylol-balsam, one slide. Natal, 20–3–01, Fuller), Illinois State Laboratory Natural History, Urbana, Illinois.

Table for Separating the Species of Trichogrammatoidea.

1. Fore wings with the longest (distal) marginal cilia equal in length, or nearly, to the longest (caudal) marginal cilia of the hind wings, the former being about a third as long as the greatest width of the fore wing. Fumated area of the fore wing extending distad to the distal end of the stigmal vein, its distal margin straight; stigmal knob rounded; club of female antenna stouter, not more than two and one-half times longer than wide.....**nana** Zehntner.
2. Fore wings with the longest (distal) marginal cilia distinctly shorter than the longest (caudal) marginal cilia of the hind wings, the former not more than a fifth as long as the greatest width of the fore wing. Fumated area of fore wing extending distad only as far as the middle of the marginal vein, its distal margin oblique; stigmal knob ovate; female antennal club slenderer, about three and one-fourth times longer than wide.....**lutea** Girault.

4. USCANA genus novum.

Normal position.

Female.—Head rounded, normal, the eyes ovate, the antennæ inserted slightly ventrad of the middle of the face, 6-jointed, short and moderately stout, consisting of a scape, pedicel, very minute ring-joint and a 3-jointed club; funicle absent. Body short and compact, the abdomen cylindrical but short, not any longer than the head and thorax together, the ovipositor not exserted, the abdomen barely longer than the thorax, usually abruptly obliquely truncate ventrad. Fore wings fumated proximad, moderately short and moderately broad, oblately nearly flatly rounded at the apex somewhat as in *Chaetostricha* Haliday but not nearly so broadly or flatly

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as in that genus, but intermediate in this respect between the genus mentioned and *Lathromeris* Foerster; fore wings with moderately short marginal fringes and dense discal ciliation which is arranged in distinct lines; a short oblique line of from four to six discal cilia leads back from the stigmal vein as in *Pentarthron* Riley. Caudal wings normal, with three longitudinal lines of discal cilia. Venation of the fore wing distinct, the submarginal vein narrow, straight, the marginal vein straight, shorter, the postmarginal vein absent, the stigmal vein set at an angle of about 65 degrees to the marginal, distinct, nearly sessile. Parapsidal furrows complete.

Tarsi 3-jointed, without claws apparently, the tibial spurs single, weak, the anterior tarsi without antennal combs or strigils, the anterior tibial spur weakest, straight. All tarsal joints moderately short, subequal. Legs normal, the caudal femora slightly thickened.

Male.—The same; abdomen not obliquely truncate ventrad but regularly rounded, somewhat longer; antennal club slightly less distinctly segmented, somewhat shorter and more compact, less conical in general outline.

A genus closely resembling *Lathromeris* Foerster as known through *L. cicadae* Howard and *L. fidiae* (Ashmead), especially in the structure of the antennæ but the antennal club is shorter and distinctly 3-segmented, the fore wings are shorter and more broadly rounded, the marginal vein is shorter and the body is short and stout, the abdomen equal to or barely longer than the thorax, not long and slender or much longer than broad; the oblique line of discal cilia leading back from the stigmal vein is present also, absent in *Lathromeris*. The type species is described herewith.

1. **Uscana semifumipennis** species nova.

Normal position.

Female.—Length, 0.80 mm. Moderately small, visible easily to the naked eye but not casually even to the trained eye. General color tawny yellow, the abdomen usually deep black, in some specimens varying to dusky yellowish, the legs dusky excepting the pallid yellow knees, the tarsi (excepting the very slightly dusky terminal joint) and the cephalic

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and intermediate tibiæ; antennæ dusky to pallid yellow; eyes bright pinkish red; wings hyaline excepting the proximal halves of the fore wings, that portion proximad of the distal end of the venation, which is distinctly, though not pronouncedly fumated; the fumated area extends to a point opposite the end of the stigmal knob and its distal bounding line is nearly straight. Venation dusky. Body sculpture inconspicuous. Colors of legs somewhat variable. Tegulæ dusky yellowish.

Fore wings with short marginal fringes along the cephalic margin, which gradually slightly lengthen along the apex, becoming twice longer at the disto-caudal apex of the wing, then gradually shortening again caudad and proximad; the longest cilia are not more than an eighth of the greatest wing width, which is near to, but not at the apex. The discal ciliation is short and moderately close, arranged in about from 16 to 20 lines across the widest portion of the wing. Marginal vein broad, straight, twice the length of the stigmal and nearly a half shorter than the submarginal vein, truncate distad; submarginal vein narrow, straight, but distad where it curves cephalo-distad to join the marginal, abruptly broader but not quite so broad as the latter. Caudal wings normal, the blade moderate in width, acuminate, the marginal cilia normal, those of the caudal margin as usual much longer, here gradually lengthening distad where they are distinctly longer than the greatest wing width, those of the cephalic margin usual, short; discal ciliation of the caudal wings consisting of three longitudinal lines of cilia, the cephalic two paired, slightly converging distad, originating at the apex of the marginal vein or nearly, the caudal line slightly fainter, originating farther proximad, gradually converging on the others toward the apex, nearer to, but not on, the caudal wing margin.

Antennæ short and moderately stout, the club forming half of their length, the scape short, not as long as the club, cylindrical, curved, the pedicel shorter than the scape, not much longer than wide, conic to subquadrate, subequal in length to the proximal club joint; ring-joint minute, flat, abruptly narrower than the pedicel or club; the three club joints distinct, the intermediate joint longest and widest (base), the apical joint small, conic, acute; the club itself pointed conic-ovate in shape. Pubescence of the antennæ sparse, consisting of scattered long hairs, mostly on the club.

From 30 specimens, ⅔-inch objective, 1-inch optic, Bausch and Lomb.

Male.—The same; the antennal club shorter not as pointed.

From 13 specimens, ⅔-inch objective, 1-inch optic, Bausch and Lomb.

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Described from 13 males and 30 females mounted in balsam and forming a series of slides in the collections of the Bureau of Entomology, U. S. Department of Agriculture, kindly loaned for study by Dr. L. O. Howard and labelled as follows: "Bred from Bean-weevil parasite material from Beeville, Texas.—Honolulu, Hawaii, Oct. 30, 1909. D. T. Fulloway." Five slides respectively—(1) 2 ♂'s, 6 ♀'s; (2) 1 ♂, 9 ♀'s; (3) 4 ♂'s, 4 ♀'s; (4) 2 ♂'s, 7 ♀'s and (5) 4 ♂'s, 4 ♀'s.

Habitat.—United States: Beeville, Texas.

Types.—Type No. *13,394*, United States National Museum, Washington, D. C., 1 ♂, 9 ♀'s in xylol-balsam (1 slide bearing sublabel "(2)"). *Cotypes.*—Accession No. *44,166* (4 ♂'s, 4 ♀'s in xylol-balsam, 1 slide bearing sublabel "(3)"), Illinois State Laboratory of Natural History, Urbana, Illinois.

5. **ITTYS** genus novum. (Figs. 8 and 9.)

Normal to the subfamily.

Normal position.

Female.—Head normal, the ocelli in a triangle in the center of the vertex, the lateral ocelli distant from the eye margins, the eyes ovate, the antennæ (fig. 8) inserted slightly ventrad of an imaginary line drawn between the ventral ends of the eyes, 8-jointed, bearing a single large distinct ring-joint* and a distinctly 3-jointed club which is ovate-acuminate; pedicel distinctly longer than the first funicle joint; funicle joints longer than wide or as long as wide; antennæ normal, with no abnormally enlarged or swollen joints, sparsely pubescent. Thorax distinctly shorter than the abdomen, the body long; parapsidal furrows distinct, complete, widely separated, Abdomen conic-ovate, the sheaths of the ovipositor prominently exserted, prominent along the ventum but the ovipositor itself not exserted; abdomen longer than the head and thorax combined. Fore wings (fig. 9) long, moderate in width, regularly rounded at apex, with moderately long marginal fringes which are about a sixth as long

* Sometimes appearing as two (2) distinct joints.

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as the greatest wing width, the venation straight, the marginal and submarginal veins unequal in length, the latter longer, the stigmal vein prominent, descending from the caudal angle of the truncate distal end of the marginal vein. Discal ciliation of the fore wings but moderately dense, arranged in regular longitudinal lines, Posterior wings with three longitudinal lines of discal cilia, the caudal one of which is much fainter. Fore wings with a distinct fuscous substigmal spot and with a long oblique line of discal cilia running back from the stigmal vein.

Tarsi 3-jointed, with claws, the joints moderately long, the proximal joints longest, the tibial spurs single, those of the cephalic tibiæ weakest, the strigils of the cephalic tarsi absent; tarsal claws weak, hidden by the fleshy pulvillus. Mandibles well developed, 3-dentate the two lateral (outer) teeth acute.

Male.—The same as the female but the abdomen is less pointed, its sides more parallel, its general form stouter; further, the marginal fringes of the fore wings are longer than in the female. Antennæ the same.

Type.—*Trichogramma ceresarum* Ashmead.

A unique genus, doubtless resembling *Calleptiles* Haliday but at once separated from that genus by the straight venation and the pointed conic-ovate abdomen of the female. The type species is large for the family, very easily seen with the naked eye. The genus is allied with *Abbella* Girault and differs from it in being larger, more robust; the funicle joints are longer than wide, the stigmal vein is strongly developed and the habitus is distinct.

1. **Ittys ceresarum** (Ashmead).

Trichogramma ceresarum Ashmead, 1888, p. 107.

Trichogramma ceresarum Ashmead—Marlatt, 1895, p. 13.

Trichogramma ceresarum Ashmead—de Dalla Torre, 1898, p. 2 and footnote; Girault, 1907, p. 30; Schmiedeknecht, 1909, p. 485.

Male.—Length, 1.4 mm.; large. General color dull honey yellow (pale cadmium yellow), with a tinge of green or even reddish; eyes delicate rosaceous; ocelli carmine, in a triangle on the cephalic half of the vertex; the distance between the eyes and the lateral ocelli is twice

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or more the distance between the latter and the cephalic ocellus which is on the cephalic margin of the vertex; also the distance between the lateral ocelli is greater than that between them and the cephalic ocellus; a few minute setigerous spots on the vertex and along the lateral margin of the mesoscutum; from dorsal aspect the abdomen with at least three distinct fuliginous or dusky bands, beginning at the caudal half of the region along each of three successive segments but sometimes with five distinct bands, which are visible on segments 2–6 respectively and six of these bands appear to be normal on segments 2–7 respectively; these bands are visible in the lateral and ventro-lateral aspects but disappear at the venter; pleuræ of thorax dusky; antennæ dusky yellow, the scape pallid and also usually the second or distal funicle joint; both wings hyaline, the fore wing, however, with a slight dusky cloud across it at the stigmal vein which is accentuated at the stigmal knob to form the substigmal spot. The fore wing proximad of this more or less distinct fumated band is also very slightly fumated. Venation dusky yellowish. Legs uniformly pallid yellow, with the exception of the dusky distal tarsal joint. Malpighian vessels red.

Head delicately rugose, thorax similarly so, finely, closely, longitudinally striate, the abdomen delicately longitudinally reticulated; discal ciliation of the fore wings arranged in about from 18 to 20 lines across the widest portion of the wing, the lines somewhat confused but the majority of them regular; the marginal cilia short proximad on both margins, but gradually lengthening distad being moderately long around the whole wing apex, very much longer than any of the discal cilia but the longest of them are not more than a fifth or sixth of the greatest wing width; marginal vein bearing six or more stiff bristles which are about equal in length to the longest marginal cilia of the fore wing; marginal vein clavate, twice the length of the stigmal vein, the submarginal vein distinctly longer than the marginal, narrow but widening to the width of the marginal vein at its distal third or at the point where it turns up to join the marginal vein; discal ciliation of the fore wing extending proximad acutely, caudad of the marginal vein, finally ending in a point consisting of several setæ in a straight line about opposite to the apex of the submarginal vein, nearer the caudal wing margin. Caudal wings normal in shape, the petiole rather longer, the blade rather shorter than usual, forming slightly less than the distal half of the wing, its apex pointed but not acute, the marginal cilia of the cephalic margin moderately short, those of the caudal margin as long as the greatest width of the wing (across the apex of the marginal vein), distinctly five to six times the size of the cilia of the cephalic margin; discal cilia of the caudal wings arranged in two principal longitudinal lines which are parallel and both about equally distinct and a third less distinct line, barely discernable, near the caudal wing margin and extending farther proximad; its cilia are

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widely separated in the line one from the other and they are minute and the line is not especially near the caudal wing margin; also in this third line the cilia become slightly more distinct distad. In the oblique line of discal cilia of the fore wings running from the stigmal vein proximo-caudad, there are about from six to ten cilia. Uncus of the stigmal vein present, normal.

Antennæ (fig. 8) 8-jointed, the segments distinct—scape, pedicel, ring-joint, two funicle joints and three club joints. Scape cylindrical oval, widest at the center, about equal to the club in length and also to the pedicel and first two funicle joints combined; pedicel conic, widest at the apex, wider and distinctly longer than the whole funicle and at least twice the size of the first funicle joint; ring-joint distinct, abruptly smaller, subquadrate, sometimes appearing as two joints; first funicle joint subquadrate, slightly longer than wide, longer than the second funicle joint, widest at the apex where it is obliquely truncate; second funicle joint subglobular, about as wide as long, slightly shorter than the first, very much smaller than the proximal club joint; funicle cylindrical, distinctly narrower than the club, pedicel and scape. Club abruptly larger, long ovate or conic-ovate, widest at the apex of the proximal joint, the distal joint acutely conical, smallest and equal in length to the others; club longer than funicle and the widest and most pubescent part of the antennæ, slightly longer than the scape. Antennæ bearing a few long, scattered, stiff setæ, most prominent on funicle 2 and the club.

From 7 specimens, $\frac{3}{4}$-inch objective, 1-inch optic, Bausch and Lomb.

Female.—The same; slightly longer and more variable in regard to the dusky bands of the abdomen which are sometimes obscure; abdomen long, conic-ovate, pointed, the sheaths of the ovipositor slightly exserted but prominent.

From 6 specimens, $\frac{3}{4}$-inch objective, 1-inch optic, Bausch and Lomb.

Redescribed at first from 7 male and 6 female specimens mounted in balsam and reared as follows: Three ♂'s, 1 ♀ reared at Urbana, Illinois, July 17, 1908, from the eggs of *Ceresa taurina* Fitch in apple twigs collected at Urbana (Accession No. *39,120*, Illinois State Laboratory of Natural History, Urbana, Illinois, 1 slide, balsam); 3 slides labelled "2793°" and "15–18", "15–19" and "15–20" respectively and from the collections of the U. S. Department of Agriculture, Washington, D. C. These slides bore 1 ♂ 4, ♀'s; 2 ♂'s, 1 ♀; and 1 ♂ respectively. The envelopes containing

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them also bore the label: "Bred from eggs of *Ceresa bubalus*, March 25, '86," and "Trichogramma." (For means of identity see below.)

Habitat.—United States: Illinois (Urbana); one other unknown locality.

Types.—Type No. *13,393*, United States National Museum, Washington, D. C., 1 ♂, 4 ♀'s in xylol-balsam, 1 slide; this slide bears the labels "2793°" and "15–18" (see foregoing). *Cotypes.*—Accession No. *39,120* (3 ♂'s, 1 ♀ in xylol-balsam, 1 slide, Urbana, Illinois, July 17, 1908) and *44,165* (2 ♂'s, 8 ♀'s in xylol-balsam, 1 slide; label, "*Trichogramma ceresarum* Ashmead. 2793°. Issued March 22–30; April 5–10, 1886." U. S. N. M. specimens), Illinois State Laboratory of Natural History, Urbana, Illinois.

This species first became known to me in 1908 when I reared it from Ceresa eggs and called it a new species of *Trichogramma* in MS. Being from the same host it was at once suspected to be the same as *Trichogramma ceresarum* Ashmead but the brief description of that species precluded any conclusion regarding identities and the chances were about equal one way as another; there was no reason why the same host could not have too distinct egg-parasites. The identity of my specimens was not settled until several years had passed and in the meantime I had established this new genus *Ittys* for their reception. It was only upon access to the remaining material of this family in the National Museum that I definitely decided just what *ceresarum* was and that it was the same as my specimens. There, mounted on tags I found a large series of this species, labelled as such but not bearing any indications of being typical material with the exception of the date of their rearing, which read several years earlier than the publication of the original description of the species. No type of the species has ever been designated and it would be foolish not to accept this opportunity to redescribe the species and deposit types. I do this here, based on these specimens and those already listed.

The species was originally described exactly as follows (Ashmead, 1888):

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" (21) **Trichogramma ceresarum** n. sp.

Female. Length nearly .04 inch. Reddish-yellow, rather slender. Eyes brown. Abdomen and posterior femora fuscous, the fore and middle femora pale brown; tibia and tarsi pale, The thorax is triangular in front; the abdomen not longer than the thorax but wider. Wings hyaline, as in *T. nigrum**, but with very strong violet reflections.

Described from two specimens reared from the eggs of the Membracid *Ceresa bubalus* Say." p. 107.

It has been listed several times (see citations) but not noticed otherwise in the literature excepting Marlatt's (1895) statement concerning its attack upon *Ceresa bubalus* and Girault's (1907) listing of it as a parasite of the eggs of the same species. It is parasitic upon two closely related species.

The following tagmounted specimens labelled "*Trichogramma ceresarum* Ashm. 2793°. Par. in eggs of *Ceresa bubalus*. Issued March 22, 25, 30, April 1, 5, 6, 7, 9, 10, 1886" were found in the collections of the National Museum: 16 ♂'s; 24 ♀'s. Also grouped with these seven specimens labelled simply "3793°", 5 ♂'s, 2 ♀'s. These specimens have been remounted in balsam on slides.

6. ZAGA genus novum.

Normal position.

Female.—Head normal, the ocelli in a triangle, the lateral ocelli not especially near the eye margins, the antennæ 6-jointed—scape, pedicel, 4-jointed club—short, the ring-joint apparently absent. Body long and slender, the abdomen pointed, slender, conic-ovate. longer than the head and thorax combined, the sheaths of the ovipositor distinctly though but slightly exserted, prominent ventrad, running the whole length of the venter, the fore wings broad nearly as in *Chaetostricha* Haliday, the discal ciliation in peculiarly regular and distinct lines and not dense but abundant, the marginal cilia uniformly short and close, the wing apex very broadly rounded, oblately so, the marginal vein short, straight and clavate, thick, widening distad, the short thick sessile stigmal vein given off nearly at right angles to it and a short

* This is now the type of the new genus *Ufens* described in this paper.—A. A. G.

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line of about from 6–8 discal cilia leading proximo-caudad from the apex of the stigmal vein. Caudal wings normal, moderately broad and with four longitudinal lines of discal cilia, the blade not slender and obtusely pointed. Legs normal, slender, the tibial spurs single, moderate in length, slender but not as long by far as any of the tarsal joints taken singly; tarsi with claws, visible in ventral aspect. Fore wings with a slight substigmal cloud and fumated proximad. Ovipositor not exserted though the sheaths distinctly so, as described.

Male.—Unknown.

Type.—*Zaga latipennis* species nova, described beyond.

A genus closely resembling *Chaetostricha* Haliday but the antennæ have a 4-jointed club, the abdomen is longer and more pointed, the funicle and ring-joint are absent and the discal ciliation of the fore wings is less dense, not crowded especially less in the caudal wings than in that genus. The genus is easily distinguished from *Lathromeris* through the fore wings which are more broad, the peculiarly distinct lines of discal ciliation, the venation, the short marginal fringes of the fore wing and the antennæ. The type species is described herewith.

Zaga latipennis species nova.

Normal position.

Female.—Length, 1.2 mm.; moderately large for the family, easily visible to the naked eye. General color lemon-yellow, the abdomen darker, banded with black, the sides of the thorax mottled with dusky, the coxæ and legs dusky, excepting the articulations, the distal ends of the tibiæ and the proximal two tarsal joints all of which are pallid. Eyes garnet. Wings hyaline but the fore wings with a slight cloud proximad under the venation, and which is bounded distad by the short oblique line of discal cilia leading back from the stigmal vein. Venation dusky. Antennæ yellowish.

Fore wings with about 18 longitudinal lines of discal cilia, all of the lines distinct and clear cut excepting at the apex, where additional cilia occur obscuring the distal ends of the lines; the discal ciliation extends but slightly caudad of the stigmal vein, a few of the central lines terminating under the marginal vein in the center of the wing blade; the oblique line of cilia running proximo-caudad from the stigmal vein originates along the distal side of the apex of that vein.

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Marginal vein gradually dilated distad, broad, about twice the length of the short thick neckless stigmal vein which is turned nearly at right angles into the wing disk, and which bears a short uncus half-way up its outer (distal) margin; submarginal vein broadened abruptly slightly distad of its proximal half, where it changes angle to extend to the marginal vein, twice longer than the latter, its thickened portion being subequal in length to the marginal vein. Caudal wings with the caudal margin slightly convex, the cephalic margin nearly straight, the blade moderately broad, narrowing distad to an obtuse point, the cephalic marginal cilia short and uniform, the caudal fringes moderately long, lengthening distad, the longest not quite as long as the greatest wing width. Discal cilia of posterior wings arranged in three principal longitudinal lines about equidistant and equally distinct and a fourth shorter but similar line of cilia between the second and third lines of the equal three; this shorter line extends from the region opposite the apex of the marginal vein to slightly more than half-way to the wing apex; none of the lines are especially near the wing margins.

Club of antennæ 4-jointed, pointed conic-ovate, widest at the second joint, the first and third joints subequal in length, the first somewhat longer, both joints subquadrate, the second joint shorter by at least a third, wider than long, the fourth or terminal joint conical, nearly as long as the third; pedicel conical; scape normal, cylindrical. Pubescence sparse, long.

From 2 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

The male is unknown. Described from two female specimens mounted on a single slide in balsam received through the kindness of Dr. L. O. Howard and bearing the following label: "Parasite bred from apple twigs infested with *Aspidiotus perniciosus*. Charlottesville, Va. Rec. Apr. 8, '95."

Habitat.—United States: Virginia (Charlottesville).

Types.—Type No. *13,395*, United States National Museum, Washington, D. C., 2 ♀'s in xylol-balsam, 1 slide.

7. **UFENS** genus novum. (Fig. 10.)

Normal to the subfamily. Fore wings with the venation not forming a bow.

Normal position.

Female.—Head normal, the antennæ inserted slighty ventrad of the middle of the face and slightly dorsad of the ventral ends of the eyes their bulbs over their own widths apart, the vertex

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not especially wide or long, bearing the three ocelli in a triangle in its center near the occipital margin, the lateral ocelli somewhat their own width apart from the eye margins; eyes ovate. The thorax and abdomen about equal in length, the latter sessile, short, stout, obliquely truncate ventrad, ovate, the whole body well proportioned, the ovipositor not exserted, the tips of the hypopygium visible but not exserted. Parapsidal furrows complete, widely separated; mesoscutellum transverse elliptical in shape, distinctly shorter than the scutum; pronotum very narrow. Legs normal, the three joints of the tarsi short, subequal in length, the proximal joint somewhat the shortest, the tibial spurs single, the posterior femora broader than the others. Tibial spurs of the cephalic legs not curved and forked to form a strigil.

Antennæ 7-jointed*—scape, pedicel, one shallow ring-joint, one funicle joint and a 3-jointed club; all of the joints wide, the funicle somewhat the widest or as wide as the widest portion of the club, the club as long as the pedicel and funicle united, the funicle as long or longer than the pedicel; and the scape cylindrical and the next longest joint after the club; pedicel and scape narrower, the funicle joint distinctly wider than the pedicel; funicle apparently divided obliquely into two joints, globular to subquadrate; ring-joint exceedingly short, thin, saucer-like.

Fore wings (fig. 10) short and broad, oblately rounded at the apex, broadest at their distal sixth or just proximad of the apex, far distad of the apex of the venation, shaped like a flat broad paddle but not as broad as in *Chaetostricha flavipes* (Girault) for instance, nearly as in the genus *Uscana* Girault; at their greatest width not more than twice longer than wide, across the marginal vein four times longer than broad; hyaline, the discal ciliation moderately dense, normal with the exception of six longitudinal widely separated radiating lines which, though not separated themselves from the

* I have had great difficulty in determining the antennal structure of this genus; the ring-joint is present but escapes certain detection very easily, while the apparently large single funicle joint has a peculiar twist to it as if divided obliquely but I cannot detect articulation here, merely thickening due to the twist.

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remainder of the pubescence yet stand out more prominently as regular rows; these regular lines have a tendency to be paired, especially the second and fifth; discal ciliation or pubescence absent proximad, caudad of the apex of the venation with the exception of a wedge-shaped or acute prolongation proximad to the proximal end of the marginal vein nearer to the caudal margin than to the middle of the wing at that point and a short straight longitudinal row of four cilia farther proximad, just under but not very near to the submarginal vein (about its true center) and separated from the remaining portion of the wing disk by the caudal spur borne by the submarginal vein where it suddenly broadens; also a similar row of three or four above the submarginal vein farther distad; discal cilia short, moderately coarse, coarser and longer than the marginal cilia; a prominent, long proximo-caudal line of about from 10 to 14 cilia, curved, leads from the apex of the stigmal vein; marginal cilia short, longest along the caudo-apical margin but there not a fifteenth as long as the greatest width of the wing, about as in the males of *Lathromeris* Foerster; a few still longer ones proximad of the marginal vein; absent on the caudal margin proximad of a point opposite to the apex of the stigmal vein. Venation straight not forming a regular arch or bow, submarginal vein slender, straight to its distal third, wider at its base (gradually so) and at its distal third suddenly widening to the width of the marginal vein, at that point also bearing a distinct backward spur, narrower, which points caudad and slightly mesad; the vein then proceeds to the cephalic wing margin to become the marginal vein which is nearly straight, much shorter than the submarginal vein, no longer than that vein's wide distal fourth and slightly longer than the stigmal vein or subequal to it; the stigmal vein proceeds disto-caudad, its angle with the marginal vein being greater than that of the marginal and submarginal veins or about 45°; apex of stigmal vein nearly truncate and very slightly broadened; near the apex it bears a short, nipple-like spur or uncus pointing nearly distad or laterad and which nearly forms a fork; postmarginal vein absent. Stigmal vein nearly Y-shaped.

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Posterior wings moderate in width, usual in shape, its blade with three longitudinal, nearly complete and equal rows of discal cilia (including the usual row along each margin, here somewhat away from the margins); marginal cilia of posterior wings normal, short along the cephalic margin, moderately long along the caudal margin where they exceed the width of the wing blade in length; posterior wings hyaline; blades widest at their bases.

Mandibles tridentate, the two outer, lateral teeth distinct and subequal, acute, moderately strong.

Male.—The same; abdomen slightly longer, its sides more parallel; antennæ with whorls of long hairs as in *Pentarthron* Riley but 7-jointed, the joints distinct yet the club not well differentiated from the funicle as in the female, all the joints subquadrate, the terminal joint with an apical bud-like appendage.

Type.—*Trichogramma nigrum* Ashmead.

A genus mostly distinguished by the 7-jointed antennæ with a ring-joint and with a large funicle joint having a peculiar twisted appearance, by dissimilar male antennæ, by the characteristic fore wings and by the short, straight, uniform marginal vein. It is closely related to *Chaetostricha* Haliday as known to me through (*Paracentrobia*) *Chaetostricha flavipes* (Girault) but the fore wings of the latter differ remarkably in the shape of the marginal and stigmal veins which are short, strongly clavate and nearly at right angles to each other and the male antennæ do not differ from those of the female.

1. **Ufens niger** (Ashmead).

Trichogramma nigrum Ashmead, 1888, p. 107.—de Dalla Torre, 1898, p. 3.—Schmiedeknecht, 1909, p. 485.

The type species of this genus was described years ago by Ashmead (1888) as follows:

"(20) **Trichogramma nigrum.**

Female. Length .02 inch. Robust, black, polished. Antennæ short, stout, brown. Legs entirely white. The scutellum is rather high testaceous, the extreme tip white. The abdomen is sessile ovate, not longer than the head and thorax, its dorsum somewhat flat. Wings hyaline,

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as in *T. acuminatum* without, however, the small blotch beneath the stigma; veins brownish; tegulæ white.

Described from two specimens." p. 107.

This species was first known to me in 1909 when I captured several females on a window at Centralia, Illinois and upon them based this new genus. Subsequently other specimens were received as listed beyond but not until very recently was I able to connect these specimens with *niger;* this was done by means of the specimens from the National Museum also listed later. These specimens were not types, not designated as such, but were simply labelled "*Trichogramma nigrum* Ashmead" and were mounted on a card with a small piece of a corn leaf, part of the midrib showing exit-holes like this parasite would make under such conditions.

For obvious reasons it is redescribed:

Normal position.

Female.—Length, 0.75 mm.; moderate in size for the subfamily; easily visible to naked eye.

General color shining black, the legs pallid yellow. Antennæ, coxæ, portions of femora, lateral aspect of tibiæ, distal tarsal joints, head, venation, tegulæ, base of the abdomen dorsad and metanotum sordid or dusky yellowish; parapsidal furrows bordered with some yellowish; mandibles fuscous. Fore and hind wings hyaline. Eyes and ocelli dark reddish, the former clothed with sparse hairs.

Sculpture of most of the body inconspicuous, the scutellum and genæ finely, longitudinally striate; pubescence sparse, long rather stiff setæ; of the six regular, longitudinal (disto-proximad) radiating rows of the discal ciliation of the fore wing, the first or cephalic line is shortest (about from 7 to 11 cilia) and proceeds from a point just disto-cephalad of the nipple of the stigmal vein straight disto-cephalad to the cephalic wing margin; it is not much longer than the stigmal vein; the second row is near the first and nearly a third longer, converging slightly distad in relation to it and proceeding from a point directly beyond the nipple of the stigmal vein; it is distinctly paired. The third row of cilia is an opposite of the fourth, distant from the second, slightly concave and proceeding nearly directly distad to the apical wing margin before reaching which it curves slightly disto-cephalad; it has its origin at the apex of the stigmal vein; the fourth is near the third but proceeding in an opposite direction, disto-caudad to the apical wing margin; it is also curved proximad, not reaching the apex of the stigmal vein; the fifth line has an analogous, but not a similar, position to that of the second; however, it is somewhat shorter, convexly curved, less distinctly paired, originates at or proceeds from

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the sixth line at about the latter's distal third, but reaches the caudal wing margin near its distal end at a point nearly opposite to the apex of the second row of cilia; the sixth or last, most caudal row is subacutely convexed at its middle and forms the caudal boundary of the proximal projection of the discal ciliation; it originates proximad near, but not touching, the caudal wing margin and proceeds distad in the form of a flat pyramid with a long (imaginary) base, ending in the caudal wing margin at about the base of the distal third of the wing. Of these six peculiarly regular lines, the third and fourth are longest. Lateral ocelli twice farther apart from each other than each is distant from the respective eye margins and slightly farther apart than each is distant from the cephalic ocellus; over their own width from the eye margins.

Antennæ clavate, with normal pubescence, sparse, long and soft setæ increasing in number on the club. Scape moderately short, cylindrical, longer than the funicle but slightly shorter than the club; pedicel obconic, shortest of the segmental regions, a fourth shorter than the funicle and nearly a half shorter than the scape; funicle much wider, broad, oval and as wide as the middle of the club, which is conic-ovate, forming over half of the flagellum, its two proximal joints complementary, the intermediate joint obliquely truncate at both ends, the apical joint pointed conic and slightly shorter; club divisions oblique. Ring-joint very short, with rimmed margins, saucer-shaped, apparently concealed within the hollow base of the funicle joint.

From 18 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—The same; antennæ entirely different, clothed with whorls of long hairs, cylindrical, the joints all equal and in the single specimen the terminal joint apparently inclosing a minute, globular eighth joint at its extreme apex like a ball in a socket. The ring-joint apparently absent, hence four funicle joints.

From a single specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Described from 1 male and 18 female specimens mounted in balsam, the coloration and sculpture from two living females, unmounted, stupefied with chloroform and taken at Centralia, Illinois, September 5, 1909 and from two females in the U. S. National Museum. The following slides: (1) A slide bearing one female labelled "On window, Centralia, Illinois, September 5, 1909 (A. A. G.);" and (2), (3), (4), (5) and (6) all bearing the label "Webster No 5737. Salisbury, N. C. R. A. Vickery," and respectively consisting of

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these specimens—1♀; 4♀'s; 1♀; 1♂, 2♀'s; 5♀'s. These specimens were received for determination from Professor F. M. Webster, in charge of cereal and forage crop insect investigations, Bureau of Entomology, U. S. Department of Agriculture, Washington, D. C., through the kindness of Dr. L. O. Howard the Bureau's chief. I have since captured a single female on a stable window at Mattoon, Illinois, July 16, 1910 and more recently have studied two females mounted side by side on a square tag, in the U. S. National Museum collection, labelled "*Trichogramma nigrum* Ashm." and "D. C. July 12. '79. Bred from mid-rib of corn leaf." These were successfully remounted in balsam and they proved to be identical with the others. Undoubtedly they are the specimens from which the species was originally described hence types, though not so designated originally. They were reared from some eggs deposited within a corn leaf along each side of the midrib.

Habitat.—United States: District of Columbia; Illinois (Centralia, Mattoon); North Carolina (Salisbury).

Type.—Type No. *13,396*, United States National Museum, Washington, D. C., 1 ♀ in xylol-balsam (Centralia, Illinois, September 5, 1909, Girault). *Cotypes.*—Accession No. *44,168* (2 balsam slides—5 ♀'s and 1 ♂, 2 ♀'s respectively. Salisbury, North Carolina. R. A. Viekery. Webster No. 5737), Illinois State Laboratory of Natural History, Urbana, Illinois.

8. NEOTRICHOGRAMMA genus novum. (Figs. 11, 12 and 13.)

In general aspect similar to *Pentarthron* Riley and also in all general characters but differing in having a moderately long, acutely trianglar abdomen ending in a sharp point and with the valves of the ovipositor prominent, long, distinctly projecting beyond the tip of the abdomen, accentuating its acuteness; in the longer discal and marginal ciliation of the fore wings both being about twice the length of those usual in the other genus; in the more enlarged posterior femora, the longer and more slender tibiæ and the longer, more slender antennal club. The posterior wings are also noticeably slender and sharp and the fore wings are long, distinctly

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longer in proportion to their width than is usual in the genus mentioned but of the same width and shape. The mandibles bear several more teeth, about five in all.

Normal position.

Female.—Head normal, somewhat wider than the thorax, the eyes ovate, the ocelli three in number in a flat triangle on the vertex; antennæ inserted slightly below the middle of the face, 6-jointed—scape, pedicel, one ring-joint, two funicle joints and a solid club, the pedicel distinctly longer than the first funicle joint, the pubescence not conspicuous, consisting of short, soft, fine hairs. Thorax somewhat shorter than the abdomen, the parapsidal furrows complete, widely separated, straight; abdomen along the meson about equal in length to the head and thorax combined, moderate in length, from the dorsal aspect acutely triangular, from the lateral aspect conic ovate, the venter oblique, the valves of the ovipositor borne along at least the distal two-thirds of the venter and projecting distinctly beyond the tip of the abdomen but not conspicuously (fig. 13); slightly exserted. Cilia of the last pair of spiracles conspicuous, projecting from each side of the tip of the abdomen.

Fore wings (fig. 11) long, about two and a quarter times longer than wide, regularly rounded, the margins of the blade similar, the marginal cilia not very long but not short, moderately short to moderately long, about twice the length of those usual to *Pentarthron* but not more than an eighth or ninth the greatest wing width, the discal cilia moderately dense, moderately large, distinct; an oblique line of discal cilia running proximo-caudad from the stigmal knob; discal cilia arranged in about from 15 to 20 longitudinal lines, uniform but not all of the lines in regular rows. Venation forming a bow as in *Pentarthron*, the marginal and stigmal veins subequal in length, the latter slender ending in a small truncate knob which bears a short uncus; the submarginal vein about two and a quarter times longer than the marginal vein. Postmarginal vein absent. Posterior wings (fig. 12) long and narrow, sharply acuminate, acute at apex, the margins of the blade similar distad of the marginal vein, the cephalic

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margin acute at the distal end of the marginal vein or at the hooklets. Posterior wings bearing three principal lines of discal cilia, the cephalic two lines paired and their cilia closer together in the line, near the cephalic margin, the caudal line with the cilia more distant from each other in the line and that line nearer the caudal margin. Marginal cilia normal, as usual those of the caudal margin distinctly longer than the wing is wide.

Legs normal but the caudal femora are noticeably stout and the tibiæ are longer than the tarsi, the latter slender, the joints moderately long, subequal, the tibial spurs single, straight, absent on the cephalic tibiæ. Ventral aspect of tarsi clothed with soft hairs which are moderately long and moderately dense.

Mandibles with five distinct teeth, the three inner (mesal) ones subequal, longer, the two outer (lateral) ones about a half shorter, subequal, all acute, nearly in a straight line.

Male.—The same. Abdomen less acute but the genitalia exserted (death). Antennæ with long soft hairs and 4-jointed, the two funicle joints but indistinctly indicated, together with the club forming a long spindle-shaped, knotted or nodular club joint. Composed of scape, pedicel, one ring-joint and a long funicle-club.

Type.—The following species:

1. **Neotrichogramma acutiventre** species nova.*

Female.—Length, 1.00 mm.; variable. Moderately large. General color dark brownish, the abdomen much darker, the posterior femora and terminal tarsal joints dusky, the remaining segment of the legs pallid yellowish as are also the antennæ; ocelli ruby red, eyes dark garnet; venation pallid yellowish to dusky; wings hyaline but the fore wings fumated proximad out as far as the end of the stigmal vein, the distal margin of the fumated area slightly obliqued caudo-distad involving proximal portions of the discal ciliation. The oblique proximo-caudal line of discal cilia running back from the stigmal vein is curved, containing about nine cilia and slightly caudad of the middle of the wing, joining a nearly reciprocal line running disto-caudad, both forming a broad v-shaped line. The marginal vein bears three

* As I will show elsewhere, this species is the *Trichogramma japonicum* of Ashmead. The name is therefore *Neotrichogramma japonicum* (Ashmead).

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long equal setæ, and the submarginal vein another of nearly equal length near its distal end; also a smaller one at the base of the stigmal vein and two others, one on the marginal vein near the middle long seta and one on the submarginal vein, a total of seven. Sculpture of the body not marked, inconspicuous.

Male.—The same.

Described from four males and fifteen females received from Professor S. I. Kuwana of Japan through Dr. L. O. Howard to whom they were sent for identification. The specimens were distributed on four balsam slides labelled respectively "6. Host: Chilo simplex (eggs). Japan. S. I. Kuwana, March, 1910."

Habitat.—Japan.

Homotypes.—Cat. No. *13,391*, United States National Museum, Washington, D. C., 1 ♂, 6 ♀'s in xylol-balsam, 1 slide. Accession No. *44,169*, Illinois State Laboratory of Natural History, Urbana, Illinois, 1 ♂, 2 ♀'s in xylol-balsam, 1 slide (sublabel "6").

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EXPLANATION OF PLATE I.

FIG. 1. Antenna of the male of *Aphelinoidea semifuscipennis* Girault, greatly enlarged; pubescence indicated only.

2. Fore wing of the male of same, greatly enlarged; the venation indicated only.

3. Antenna of *Tumidiclava pulchrinotum* Girault, greatly enlarged; the pubescence indicated only.

4. Antenna of the male of *Abbella subflava*, the pedicel enlarged slightly too much; pubescence indicated only.

5. Wing of the same, greatly enlarged; the discal ciliation indicated only.

6. Antenna of the female of *Trichogrammatoidea nana* (Zehntner), enlarged. From Zehntner, through kindness of Dr. L. O. Howard. Redrawn.

7. Antenna of the male of same. Redrawn from Zehntner's original figure, through kindness of Dr. L. O. Howard. Note that the ring-joint is omitted in the figure, the antenna being 8-jointed instead of 7-jointed as represented here.

8. *Ittys ceresarum* (Ashmead), female antenna, enlarged; pubescence indicated only.

9. Fore wing of the same, enlarged; discal ciliation shown a little too dense.

10. Fore wing of *Ufens niger* (Ashmead), female, greatly enlarged; the ciliation indicated only.

11. Fore wing of *Neotrichogramma japonicum*, female, greatly enlarged.

12. Posterior wing of the same, female, greatly enlarged.

13. Apex of the abdomen of the same, female, indicating the manner and degree of exsertion of the sheaths of the ovipositor; greatly enlarged.

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Synonymic and Descriptive Notes on the Chalcidoid Family TRICHOGRAMMATIDÆ with Descriptions of New Species.

BY A. A. GIRAULT.

These synonymic and descriptive notes form another lot of matter which I wish to eliminate from a revision of the family now in preparation. In another paper I described some new genera which it was necessary to establish but my final revision of the genera has not been definitely formed as yet. Thus *Pentarthron* Riley I may finally decide to combine with *Trichogramma* Westwood; and *Westwoodella* Ashmead with *Oligosita* Haliday. Several new species in both of these questioned genera are described in this paper. *Pentarthron minutum* (Riley) I have left untreated until later as I have not decided as yet just what its limiting specific characters are; it is very widely distributed, variable and has a great number of hosts scattered over several orders of insects. In regard to *Trichogramma* Westwood I must confess that I do not know what it is excepting what may be known by consulting Westwood's original and revised descriptions of it and what I have learned indirectly concerning it.

Besides these few points, there is another in regard to the value of the two subfamilies and the distribution of the various genera among them.

It will be noticed in the descriptive matter following that for specific characters wing ciliation, relative width and length of the wings, the form of certain antennal joints, habitus and the like have been relied upon more and more and general coloration, unless very marked, less and less so that coloration here takes minor rank in most instances as a specific character. This is so because the other characters are more stable and more easily distinguished. In certain genera, notably *Pentarthron* Riley (*minutum*), there exist what are undoubtedly biological species but I do not consider them of importance when viewed from a strictly systematic standpoint; in practice they are not perceivable as systematic units; nevertheless, I think they must be viewed as potential systematic units.

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JAPANIA genus novum.

Normal position.

A genus resembling *Lathromeris* Foerster in general appearance but differing in having two distinct funicle joints in the antennæ; more closely allied with *Ufens* Girault and *Ittys* Girault, differing from the former in having the funicle distinctly divided into two subequal joints, combined smaller than the pedicel, in having a conic-ovate abdomen as long as the head and thorax combined and more slender fore wings without peculiarly distinct lines of cilia, the discal ciliation moderately dense, arranged in regular lines none of which, however, are conspicuous as in *Ufens;* also from the last named genus indirectly in having no sexual antennal dimorphism. From *Ittys* this genus differs in the decidedly shorter marginal vein of the fore wing, in the less sharpened and shorter abdomen, in the shorter marginal ciliation of the fore wing and in its much smaller build in general.

Female.—Body slender. Tarsi 3-jointed. Pubescence of fore wings arranged in regular lines. Venation straight. Ovipositor not exserted. Antennæ 8-jointed—scape, pedicel, one ring-joint, 2-jointed funicle and 3-jointed club, the latter cylindrical-ovate, long, the first funicle joint nearly twice the size of the second, the pedicel longer than their combined length; ring-joint distinct. Fore wings convexly rounded at the apex, the marginal ciliation moderately short, the discal ciliation uniform and moderate in density, the oblique line of cilia running back from the stigmal knob present, consisting of about six cilia; at their widest portion, the fore wings with about fifteen lines of discal cilia. Submarginal vein two and a half times longer than the marginal, widening distad where it breaks nearly to the width of the marginal vein, the latter short, straight, rather thick, slightly longer than the stigmal vein which is moderately strong, moderately long, terminating in an ovate knob with an acute uncus pointing distad projecting from its distal margin at the middle; its neck short, slender. Posterior wings without the usual discal cilia at the edges, with three longitudinal lines of them within, the first (cephalic) two side by side near the cephalic margin,

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equal, the third near to the caudal margin, its cilia farther apart in the line. Marginal cilia of the caudal margin of the posterior wings longer than the greatest width of that wing. Abdomen pointed-ovate, from lateral aspect slender, somewhat longer than the rest of the body, sessile, acute at tip, the ovipositor not exserted. Legs normal, the caudal femora somewhat thickened, the tibial spurs single, short, apparently absent on the cephalic legs, the tarsal joints all short.

Male.—The same but differing in having parallel sides to the abdomen which is regularly ovate, stout and obtuse at tip; antennæ the same but the pedicel is shorter, the funicle joints longer. Pubescence of antennæ consisting of sparse, moderately long setæ of which several shorter ones project from the tip of the club.

Type.—*Japania ovi* species nova, described beyond.

1. **Japania ovi** species nova.

Normal position.

Female.—Length, 0.50 mm. Blackish to dusky yellowish, variable, the cephalic aspect of the head yellow; coxæ, intermediate and caudal femora dusky yellowish; cephalic femora, the trochanters, the tibiæ and tarsi pallid yellowish, the antennæ somewhat darker yellowish; wings hyaline, the venation dusky yellowish; tip of abdomen yellowish. Body suffused with yellowish. Middle club joint of antenna as long as the terminal joint, the proximal club joint short.

From 2 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—The same, only the body is dusky yellowish throughout.

From 2 specimens, the same objective and optic.

Described from two males and two females received from Mr. George Compere of the Horticultural Commission of California through the courtesy of Dr. L. O. Howard, mounted on two slides labelled "15,032" and stated by Dr. Howard (*in litt.*, October 19, 1910) to have been reared from leafhopper eggs on banyan in China.

Habitat.—China.

Types.—Type No. *13,626*, United States National Museum, Washington, D. C., 2 ♂'s, 1 ♀ in xylol-balsam, 1 slide.

Cotypes.—Accession No. *44,185*, Illinois State Laboratory of Natural History, Urbana, 1 ♀ in xylol-balsam.

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Genus **PENTARTHRON** Riley.

1. **Pentarthron euproctidis** species nova.

Normal position.

Fore wings slightly fumated proximad; posterior wings without three complete lines of discal cilia; oblique line of cilia running back from the stigmal vein long, with from 6 to 10 cilia, usually 7; males winged.

Female.—Length, 1.15 mm.; large for the genus. Similar in general to the other species, especially *minutum* Riley, but averaging distinctly larger and differing in the following particulars: The discal ciliation of the fore wing is somewhat denser ranging from 15 to 18 longitudinal lines across the widest portion of the wing blade and the oblique curved line of discal cilia leading back from the stigmal knob is nearly complete, that is, nearly joins a complementary or reciprocal line to form a v-shaped line of cilia and contains from 6 to 10 cilia, usually 7; in the posterior wings the cephalic longitudinal line of discal cilia contains from 6 to 8 cilia while the caudal line is three-fourths complete, or is noticeably longer than in *minutum* and noticeably incomplete as compared with *semifumatum;* it would require two or three more of the cilia to be complete. General color variable, from pale cadmium yellow to dusky, but usually the thorax pale cadmium yellow, the abdomen dusky, contrasting somewhat, the head nearly concolorous with the thorax with the face pallid, contrasting sharply in some instances, the antennæ concolorous with the thorax, the legs the same but more pallid; eyes bright red; fore wings slightly fumated as in *minutum;* the venation dusky yellowish; the apical tarsal joint dusky. Antennæ nearly similar to those of *minutum*, the two funicle joints subequal, slightly longer than wide, both united subequal in length to the pedicel which is obconic; the solid club is usual, subequal to the usual scape; ring-joint normal. Mandibles with three principal teeth which are subequal and apparently several very minute ones between them.

From 69 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—The same, but the face is pallid more often, concolorous with the legs and contrasting with the rest of the body; the antennæ are usual consisting of a scape, pedicel, one ring-joint and an indistinctly 3-jointed funicle-club bearing the usual long, whorled hairs; the two segments of the funicle are not actually articulated, but the articulations are indicated by slight but distinct constrictions between the club and distal joint and between the two joints themselves; taken together they are somewhat shorter than the outline of the club itself, but each is distinctly longer and broader than the pedicel. The tarsi are not shortened as in apterous males and this sex is not smaller than the female.

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From 39 specimens, same objective and optic.

Described from the following specimens from the collections of the Bureau of Entomology, U. S. Department of Agriculture, Washington, D. C., received through the kindness of Dr. L. O. Howard: Eleven balsam slides bearing 6 ♂'s, 19 ♀'s labelled "2006. Gypsy Moth Parasite Laboratory. European species," and bred from parents reared from imported egg-masses of the brown-tail moth, *Euproctis chrysorrhœa* (Linnæus) from Europe, 4th generation; 3 balsam slides bearing 7 ♂'s and labelled "1869 B. Gypsy Moth Parasite Laboratory," reared from the parents of the preceding, 3rd generation. Also 2 balsam slides from the National Bureau of Entomology collection labelled "9309°. *Trichogramma pretiosa* Riley. From tortricid (?) eggs on Polygonum. D. C. August 29, 30, 1900", bearing 3 ♂'s, 9 ♀'s and 15 ♂'s, 13 ♀'s respectively; 3 balsam slides labelled "from lepidopterous eggs, Bloomington, Illinois, August 20, 1910, A. A. Girault. *Pentarthron euproctidis; P. minutum.*" Of the former, 1 ♂, 2 ♀'s; 3 ♀'s and 1 ♀ respectively; miscellaneous moth eggs. One slide bearing 1 ♀ labelled "U. S. N. M. specimen, Washington, D. C. Remounted from a tag." Another slide bearing 2 ♂'s, 12 ♀'s from U. S. N. M. collection labelled "Lepd. eggs on oak, Oct. 16, '83." Remounted in balsam from tagmounted specimens. And 2 balsam slides received from Mr. George Compere of the Horticultural Commission of California through Dr. L. O. Howard, labelled "No. 15,052" and "No. 15,068" and respectively stated by Dr. Howard (*in litt.*, October 19, 1910) to have been reared from a cluster of moth eggs (4 ♂'s, 8 ♀'s) and to have been captured while resting on a cluster of moth eggs (1 ♂, 1 ♀) respectively, in Japan.

Habitat.—Europe; United States (District of Columbia; Bloomington, Illinois; Massachusetts—(imported from Europe); Japan. Here we have a species imported from Europe to the United States a year or so ago but which was evidently already here.

Types.—Type No. *13,627*, United States National Museum, Washington, D. C., 2 ♂'s, 1 ♀, 1 slide (G. M. L. 2006),

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Europe. *Cotypes.*—Accession No. *44,190*, Illinois State Laboratory of Natural History, Urbana, Illinois, 1 slide, 1 ♂, 1 ♀ (G. M. L. 2006), Europe.

This species may be the same as *carpocapsæ* Ashmead (Schreiner) but I have no means of telling because of the inadequate description and grotesque illustration of that species. To say that it is is as bad or worse than to say that it isn't and I think most is to be gained by considering it quite distinct. So far as may be told from the description of *carpocapsæ* it is different, but if Schreiner's figure is indicative of the character of his description the latter must be untrustworthy. I am more concerned to know whether it may not be an extreme variation of *minutum* Riley.

2. **Pentarthron semblidis** (Aurivillius).

Oophthora semblidis Aurivillus, 1897, pp. 253–254, tafl. 5, figs. 1, 2, 3 and 3 a and 4–10.

Oophthora semblidis Aurivillius—Silvestri, 1908, pp. 72–83, text-figures.

(*Oophthora*) *Pentarthron semblidis* (Aurivillius)—Girault, 1910, p. 275.

This European species is so closely allied with the type species of the genus—*minutum* Riley—that the only distinct differentiating character which I am able to detect, other than habitus, is the presence of dimorphism in the male. It is true that the specimens which I have seen are nearly all dark and uniform in color but the great variation in color of the type species makes this character in *semblidis* of little specific value. The species was originally described as the type of a new genus—*Oophthora* Aurivillius—and is very accurately figured. The figures accompanying the original description of the species are unusual for the faithfulness in showing details but they do not show the obvious infuscation of the fore wings.

From what may be called paratypic specimens—being two slides bearing all forms of the species probably selected from the same series from which the original description was drawn and possibly the actual specimens (no types were deposited or mentioned by the describer) I add the following descriptive details:

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There is no sexual color dimorphism; the coloration of the specimens is fuscous or brown, the legs, antennæ and venation being somewhat clearer, the tibiæ and tarsi usually pallid but not abruptly so, there being no marked contrast in colors; the fore wings are slightly infuscated at their proximal halves as in *minutum* and they bear about the same number of longitudinal lines of discal cilia as in that species, and about the same number of discal cilia in the oblique line running back from the stigmal vein, namely, usually 5, but ranging from 4 to 6*; the venation of the fore wing is not different from that in the type species nor is the marginal ciliation, though usually here the fringes are somewhat longer and less abruptly, more gradually change in length from the cephalo-distal margin to the caudo-distal margin; but in *minutum* also this change is gradual but, in general, less so than in this species. The discal ciliation of the posterior wing differs from that of *minutum*, but very slightly, the cephalic and posterior longitudinal lines having a tendency to be longer by one cilium but this is not a reliable differentiating character. The antennæ of the female are similar to those of *minutum* as are those of the winged male similar to those of the male of *minutum*, but those of the wingless male are quite different from any known male antenna of the genus being very similar to those of the female but the club-joint has parallel sides and is relatively longer, not obliquely truncate along one side of the apex as in the female. The tibial spurs are single, apparently absent on the cephalic legs and inconspicuous on the intermediate legs; the tarsal joints of the wingless males are noticeably different from those in the winged forms, both males and females, being much shorter especially in the cephalic and intermediate legs. The mandibles are tridentate. The figures of the species given by Aurivillius are as correct as drawings will allow, with the exception noted above.

These descriptive notes were taken from the specimens before mentioned on two slides labelled in the handwriting of Aurivillius as follows: "*Oophthora semblidis* Auriv. Blidö, 1896." and consisted respectively of 3 apterous males, 1 alate male, 15 females and 3 apterous males, 1 alate male and 14 females. They were obtained through the ready kindness of Dr. L. O. Howard to whom they were sent by Aurivillius. I have found other specimens on a slide also obtained from the collections of the National Bureau of Entomology through Doctor Howard and labelled "*Trichogramma minutum* Riley. Egg-parasite of Chauliodes. July

* In the right fore wing of one specimen I have seen as many as 7, which number was sufficient for the line to reach the discal ciliation; the left wing had but five.

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1900, Saranac, N. Y. J. G. Needham" and bearing 6 apterous males and 7 females. I am unable to distinguish these specimens from the others labelled *semblidis;* hence the species occurs in the United States.

In regard to the apterous males it may be recalled that Riley once mentioned brachypterous specimens of *minutum* (Riley, 1885, *Trichogramma pretiosa*) but later Girault (1907 *a*) showed that these were simply imperfect specimens with the wings as yet unfolded, or at least showed that the existence of these so-called brachypterous specimens may have been thus explained. This naturally leads to the question whether the apterous males of *semblidis* or *retorridum* may not be these imperfect males, which having been killed too soon after their emergence as adults to allow for the time necessary under some conditions for the unfolding of the wings, appear to be wingless; but with these two species this can hardly be so because (1) the antennæ of all such males are different, a correlation; and (2) the wings are very minute, barely indicated, not large as is the case where development has been mechanically arrested.

Subsequent to its original description, this species has attracted very little attention not being noticed systematically; however, Silvestri (1908) has given us a very valuable and thorough study of its development.

In this connection I have forgotten to mention that the apterous males are not very much smaller than the winged specimens, not minute as with the apterous males of the species *retorridum*. Of the specimens mentioned above, the nineteen on the first slide listed have been deposited in the collections of the Illinois State Laboratory of Natural History and given the accession number *44,188*.

3. **Pentarthron semifumatum** Perkins.

This species very recently described by Perkins in the current volume of Fauna Hawaiiensis* is the only well-marked species of the genus but even at that is subject to some confusion with the type species on account of the fact that the

* I have merely seen the proof of this paper. It had not been published up to December, 1910.

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latter may sometimes have the fuscation of the fore wings as intense as it occurs usually with this species and may be as black as this species. But *semifumatum* may be distinguished at once from the fact that the posterior wings have three complete lines of discal cilia.

As its name indicates, the fore wings of this species are deeply and distinctly fumated at their proximal half which contrasts with the remaining clear portion of the wing. It is true other species have some fuscation but with them it is slight not noticeable casually and has usually been omitted in descriptions.

From specimens hereinafter listed I draw the following additional descriptive details:

Similar to *minutum* Riley but the wings have the following structural characteristics—the oblique curved line of discal cilia running back from the stigmal vein contains from 7 to 9 cilia and is long and complete, that is joins the proximal extension of the discal ciliation and joining a complementary or reciprocal line running disto-caudad forms a v-shaped ciliated line like a broad upper portion of the Greek letter upsilon; besides the deep fumation this is the characteristic borne by the fore wing; the posterior wing has three complete lines of discal cilia, the intermediate one as usual being the more prominent. Otherwise I am unable to distinguish the species from *minutum*. The ovipositor is slightly more prominent; the antennæ are similar, the ring-joint perhaps less distinct but not enough so as to be characteristic. The males are smaller, with the usual male antenna, winged and more variable as to general coloration, both the head and thorax being liable to be sordid yellowish, the body to be shorter, more compact, robust, especially noticeable in the shorter tarsal joints. In both sexes the single tibial spur of the posterior legs, and also the intermediate legs, is large, the cephalic tibiæ apparently spurless. The ovipositor is slightly larger than usual, so as to seem somewhat top-heavy.

The foregoing notes taken from two slides of specimens received in alcohol from Dr. D. T. Fulloway and mounted in balsam. They were labelled as follows: "No. 1–1910. Egg-parasite of *Phlegethontius cingulata* on sweet potato. Honolulu. 11. iv. 10.", 6 ♀'s and 2 ♂'s, 2 ♀'s respectively. The slide bearing 6 ♀'s has been deposited into the collections of the Illinois State Laboratory of Natural History and given the accession number *44,189*.

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4. **Pentarthron brasiliense** Ashmead.

Pentarthron brasiliensis Ashmead, 1904, p. 521.

Pentarthron brasiliense Ashmead—Schmiedeknecht, 1909, p. 487.

This species belongs to this genus. I have made the following notes from the type specimen in the United States National Museum collection:

Fore wings as in *Pentarthron* Riley as far as venation is concerned but not as large, shorter, more rounded, the apical margins nearly circular in outline, the marginal fringes moderately long, about three times longer than is usual to the genus; discal ciliation of the fore wing in distinct lines, about twelve lines across the widest part of the wing, the lines not very close together, the oblique line of cilia running back from the knob of the stigmal vein absent; fore wing slightly fumated from the base out as far as the middle of the marginal vein. Posterior wings with the marginal fringes of the caudal margin much longer than the marginal fringes of the fore wing and with at least one principal line of discal cilia, nearer the cephalic margin, the other two lines usually present in the genus, here absent. Ovipositor not exserted. Parapsidal furrows complete, widely separated. Antennæ —scape, pedicel, one ring joint, two funicle joints and a solid club. Sculpture of the body inconspicuous; body smooth. Caudal margin of the mesoscutum acute at the meson, its sides oblique and straight. Antennæ normal; pedicel long-obconic, about twice the united length of the two funicle joints, the first funicle joint broader and longer than the second by about a third, both wider than long. Club of the antennæ acuminate-conic, as long as the elongate pedicel, the flat ring-joint and the funicle combined. Funicle and club with a few long, scattered setæ. Typical *Pentarthron* excepting for the elongate antennal pedicel, the moderately long fringes of the fore and posterior wings and the absence of the oblique line of discal cilia leading back from the knob of the stigmal vein.

From a single tagmounted type female labelled "*Pentarthron brasiliense* Ashm. Type. Type No. *6596*, U. S. N. M. Collected on cotton, Bahia, March, '83." For the purpose of obtaining these notes the specimen was remounted in balsam, relabelled and deposited in the same place. For its coloration see the original description.

5. **Pentarthron retorridum** species nova.

Normal position.

Males apterous; fore wings of female slightly fumated proximad; posterior wings without three complete lines of discal cilia. Oblique line of cilia running back from the stigmal knob short, incomplete, containing but two cilia.

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Female.—Length, 0.65 mm. Visible to unaided eye; moderate in size.

Similar to *Pentarthron minutum* (Riley) and *P. semblidis* (Aurivillius) in aspect and structure but differing in habitus and as follows:

Mainly in ciliation of the wings. The oblique line of discal cilia running back from the knob of the stigmal vein has at the most three cilia, usually two, hence is short; the discal ciliation is denser, less distinctly arranged in straight lines; the marginal ciliation of the fore wing is distinctly longer. In the posterior wings the two caudal lines of discal cilia are complete; the anterior line of cilia is distinctly more than half complete, containing from seven to eight cilia (in *minutum* and *semblidis*, this anterior line is short usually containing from two to six cilia and not more than half complete, usually not half complete; the posterior line is incomplete).

Differing next in antennal structure: The funicle joints are both distinctly wider than long, transverse, the first longer than the second but neither longer than wide or subquadrate. Otherwise, the same structurally as the two other species mentioned. Easily separated upon comparison of specimens and with the characters given but not without care in either case.

In color differing from normal yellow specimens of *minutum* in not being intensely yellow but grayish or dusky yellowish, dull in color, the abdomen varying to brown-black; doubtless, as in *minutum* the general body coloration is widely variable.* The fore wings are fumated proximad as in *minutum*, but not conspicuously as is usual in *semifumatum* Perkins. Antennæ normal—scape, pedicel, ring-joint, two funicle joints and a solid club, shorter than in *minutum*.

From 7 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.†—Decidedly smaller, minute, mere specks to the unaided eye. Length variable, averaging 0.20 mm. Wingless, the tarsal joints shortened. Antennæ short, the scape, pedicel and ring-joint distinct, normal, the funicle and club united into a conic-ovate club as long as the scape but distinctly divided into funicle and club regions but the two funicle joints united into a solid piece. Club with but moderately long hairs as in the normal males of the genus.

From 17 specimens, same objective and eye-piece; also high power.

This species is similar to *semblidis* Aurivillius in having

* See following.

† See later for description of the winged male.

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apterous males but dimorphic males are not present here apparently* and the apterous males of *retorridum* have a different antennal structure than those of *semblidis;* the latter agree as concerns antennal shape and structure with the females, the winged male of the species differing as in the case of the normal male of the genus. Hence, apparently apterous males in this genus are aberrant forms perhaps with more or less structural variation.

Described from 17 males and 7 females received for identification from Mr. R. L. Webster, Office of the State Entomologist, Ames, Iowa and reared from the eggs of the wheat-head army worm, *Meliana albilinea* (Hübner). The 9 slides bearing the specimens were labelled as follows: (1) "From eggs of *Meliana albilinea.* Exp. 602. Sept. 1910. R. L. Webster", 4 slides, 6 ♂'s, 5 ♂'s + 2 ♀'s, 3 ♂'s and 3 ♂'s respectively. (2) "From eggs of *Meliana albilinea.* Exp. 528. 3 Sept., 1910. By T. M. M.", 1 slide, 1 ♀. (3) same label and "Exp. 533. 7 Sept., 1910. By Thos. McCall.", 2 slides, 1 ♀ each. (4) "Depositing into eggs of *Meliana albilinea.* Ames, Iowa, 23 August, 1910. R. L. Webster", 1 slide, 1 ♀. And (5) "From eggs of *Meliana albilinea.* Exp. 535. 30 August, 1910. By T. M. M.", 1 slide, 1 ♀.

Habitat.—United States: Corwith and Ames, Iowa.

Types.—Type No. *13,628*, United States National Museum, Washington, D. C., 1 female in xylol-balsam (No. 2 in the series of slides given above). *Cotypes.*—Accession No. *44,186*, Illinois State Laboratory of Natural History, Urbana, Illinois, 2 slides, 3 ♂'s of No. 1 and 1 ♀ of No. 5 of the series of slides given above; also 1 alate ♂ of No. 4 in the series of slides given beyond.

Since writing the foregoing, I have also examined the following specimens received from the same source as the others already listed: (1) Five slides labelled "From eggs of *Meliana albilinea.* Exp. 535. 30 August, 1910. By T. M. M.", bearing respectively 3 ♀'s, 1 ♀, 3 ♀'s, 3 ♀'s and 1 ♀. (2) One slide bearing a single female labelled "De-

* See later for description of the winged male.

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positing into eggs of *Meliana albilinea*, Ames, Iowa, 26 August, 1910. R. L. Webster." (3) A slide bearing a single winged male labelled "From eggs of *Meliana albilinea*. Exp. 578. September 12, 1910. By Thos. McCall." (4) Another slide bearing a single winged male and labelled the same as the preceding and "Exp. 528. September 3, 1910. By T. M. M."; also two badly shrivelled tagmounted females with the same label, (5) A slide bearing a single female, labelled as the preceding and also "Exp. 533. September 7, 1910"; also six tagmounted females similarly labelled; a few of these were in tolerably good condition, not shrivelled very much. (6) One winged male, five females tagmounted, labelled "From eggs of *Meliana albilinea*. Exp. 529. September 3, 1910; remounted in xylol-balsam but bad specimens for study.

From the series of tagmounted specimens of No. 5 of the preceding paragraph, the body sculpture was seen to be a fine reticulation as with the other species of the genus, the occipital region lined with fine, curved lines; more than this could not be seen in this respect. These specimens were nearly entirely black, only the head and a streak on the thoracic notum showing yellowish. Hence, coloration here varies nearly as much as in *minutum* but I have seen no specimens which were intensely yellow, quite common if not usual with *minutum*.

Also in the series above it will be noticed that there were two winged males, a form not present in the first series of specimens. These males are the same in size and otherwise as the females, excepting of course the secondary sexual characters which are usual; they are colored like the females first described. The antenna has the funicle-club shorter than usual with the winged males of the other species and the funicle joints are not distinctly indicated by constrictions but the whole appears more like a solid piece. As usual, it bears long setæ which, however, are irregular and the nodular areas are not conspicuous.

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Genus **WESTWOODELLA** Ashmead.

1. **Westwoodella americana** (Ashmead) Girault.

Oligosita americana Ashmead—Girault, 1909, pp. 106–110.

This species was described recently; it is removed to this genus because of the substigmal fumated spot which it bears on the fore wing.

In addition to what has already been written concerning it, in the original description, I desire to place on record the fact of having seen the original slides bearing the specimens from which Ashmead named the species and to add one or two important notes. The original specimens were found in a collection of slides kindly loaned to me for study by Dr. L. O. Howard. Amongst this collection I found four slides labelled in Ashmead's handwriting "*Oligosita americana* Ashm." and bearing two distinct species of this genus, *W. americana* and *W. sanguinea* nova, described beyond. The labels of these slides were in detail as follows, merely the scientific names of the parasites being in Ashmead's handwriting: (1). "W. No. 1892[a] F. M. Webster, Wooster, Ohio; Urbana, Illinois. Reared with *E. eragrostidis*. *Oligosita americana* Ashm. *Polynema citripes* Ashm." This slide bears 2 ♂'s, 2 ♀'s of *Westwoodella sanguinea* Girault and 1 ♂, 1 ♀ of *Polynema longipes* (Ashmead) Girault. (2). "Webster No. 1892. *Oligosita americana* Ashm. ♀." This slide bears three female specimens of *W. sanguinea*. (3) "Webster No. 1892. *Oligosita americana* Ashm. ♀." This slide bears single male and female specimens of *W. sanguinea* Girault. And (4). "Webster No. 1895[d]. *Oligosita americana* Ashm. ♀." These specimens were 6 males and 3 females of *W. americana*, hence forming all of the original specimens.

In the original description of this species it was stated that the description was based on five female specimens but a re-examination of the slide bearing the type specimens shows that this was a mistake, there being in reality but a single female specimen present the other four being males. From this single female specimen and the three additional ones forementioned, it is seen that the males differ from the

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females in having a plump ovate abdomen, blunt caudad, whereas in the other sex it is conic-ovate, obliquely truncate beneath caudad and hence pointed; the antennal structures are the same in both sexes but in the female the terminal club joint ends in two more or less prominent spines which are less conspicuous in the male; and colorationally, the females differ in having the three transverse black bands of the abdomen subobsolete, inconspicuous, if not absent, contrasting in this respect with the male. The genitalia of the male are not exserted in death. In the original description of this species, therefore, all that is given applies to the male which was mistaken for the female. It applies as well to the female with the exceptions noted. I have examined 18 specimens altogether, the four males and one female of the type, the three females and six males of the original specimens from which Ashmead named the species (Webster's No. 1895[d]) and four female specimens taken on windows. These latter specimens were taken at Centralia, Illinois August 27 and September 6, 1909 and at Urbana, Illinois, a single female taken from the glass sides of a greenhouse April 30, 1910. The two lateral, outer teeth of the mandibles are strong, fuscous, the third tooth weak, pallid.

In regard to the Webster number of this species, No. 1895[d], Professor F. M. Webster in a letter dated March 12, 1910 wrote:

"No. 1895 was reared from *Elymus canadensis* growing along the Illinois Central Railroad, north of Champaign. This *Elymus* grows quite abundantly on the west side of the track at the second crossing north of town. I think that the specimens that Robert reared and turned over to you about a year ago, came from this same locality, only of course at a later date."

The following additional notes are added concerning the female:

The abdomen is stout and conic-ovate, slightly longer than the head and thorax combined; eyes ovate-reniform; the few discal cilia of the fore wing proximad of the stigmal vein, caudad of the marginal vein consists of two short inconspicuous longitudinal lines of about three minute cilia each, and another line disto-cephalad of the others or

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nearly *en echelon;* the group of discal cilia in the distal third of the wing contains about 12 lines; fore wings slightly infuscated throughout but not uniformly. Antennæ 7-jointed, the joints as in the male; pubescence sparse, the setæ moderately long and soft, most numerous on the club. Scape slender, cylindrical, subequal to the club in length; pedicel obconic, distinctly longer than the funicle, subequal in length to the intermediate club joint or longer and nearly as wide; ring-joint abruptly smaller, nearly as wide at its base, however, as the base of the funicle joint which is longer than wide and oval in shape, the smallest antennal joint excepting the ring-joint and the proximal club joint; the latter subequal to the funicle in length, hemispherical, wider than long and about a third shorter than the intermediate club joint, which is subquadrate and slightly longer than the conical terminal joint; the latter bears at its apex two long spine-like setæ which are not as long as the distal club joint; they adhere closely and often appear as one. Club ovate, forming the larger of the two halves of the flagellum.

What is known further concerning this species may be found in Girault (1909). I have since captured the following specimens: Six females July 8, 1910 and 3 ♀'s July 27, 1910 from the sides of a greenhouse on the campus of the University of Illinois, Urbana.

2. **Westwoodella sanguinea** species nova.

Oligosita americana Ashmead MS. (partim).—See preceding and following.

Normal position.

Female.—Length, 0.55 mm.; moderately small. General color uniformly deep blood red or sanguineous*: Antennæ, legs including the coxæ†, shoulders and a portion of the venter of the mesothorax, dusky, in life the antennæ dusky and pallid alternately, the legs pallid marked with blackish; trochanters, articulations of the legs and antennæ and the proximal two tarsal joints, the occiput, genæ and face‡, pallid; apical joints of the tarsi deeper dusky. Venation pallid. Fore wings hyaline with the exception of a conspicuous rounded dusky or sooty spot‖ under or caudad of the stigmal vein and a very slight cloudy streak across the wing in the same place, a faded continuation

* In balsam the color fades to a beautiful pink or else becomes carmine.

† Excepting the brown-black cephalic coxæ in one specimen.

‡ In two specimens the genæ ventrad of the eyes across the clypeus were brown-black.

‖ This spot is considerably faded in some specimens.

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of the sooty spot*. Posterior wings hyaline. Tegulæ neutral. Eyes dark reddish ; ocelli the same color. Outer teeth of mandibles fuscous. Sculpture of body not conspicuous. Eye with sparse hairs, subreniform or rounded with its caudo-lateral margin concave, their surface coarse, much coarser than the fine longitudinal striation of the thoracic nota and pleura or the the transverse striation of the vertex, that of the occiput and face; abdomen with fine polygonal sculpture. Ocelli in a nearly equilateral triangle in the center of the vertex near the occipital margin, the lateral ones distant from the eyes, the distance between them being slightly greater than the distance between each and its respective eye margin. Fore wing narrowed, at least four times as long as its greatest width, widest just before its apex, the latter rounded, the whole wing spatulate in shape, not linear but narrower than that of the species *americana ;* discal cilia of the fore wing apparently absent but (high power) in the distal half of the blade, beyond the fumated spot, a similar longitudinal line on each side, the caudal line longer, the cephalic line containing about six or seven cilia all widely separated in the line and a few irregularly placed similar cilia distad; the usual line of cilia arising on the disk of the wing from nearly between the bases of the marginal cilia, disappears, after rounding the apex of the wing from the cephalic margin, at the distal end of the caudal margin. Marginal cilia of fore wing long, dark, most conspicuous and longest at the wing apex where they are about equal in length to the greatest width of the wing. Marginal and submarginal veins linear, the latter slightly longer than the former; postmarginal vein absent; stigmal vein very short. The marginal vein proper bears four large setæ from its surface. Posterior wing naked discally, with the exception of the faintly indicated longitudinal line along the cephalic wing margin ; its venation narrow and continuous ; its blade portion linear with an obtusely pointed apex and the marginal cilia short on the cephalic margin but long conspicuous and dark on the caudal margin, especially distad; here they are nearly three times as long as the wing is wide but not as long as the longest marginal cilia of the fore wing.

Thorax and abdomen normal, the parapsidal furrows complete; ovipositor not exserted. Legs normal; proximal tarsal joints lengthened somewhat, not quite equal in length to the two distal joints combined; the intermediate tarsal joint a fourth longer than the distal joint which is about a third shorter than the proximal joint. Abdomen conicovate, obliquely truncate caudad, nearly as long as the head and thorax combined. Mandibles apparently 3-dentate, the two outer, lateral teeth strong, dark, acute.

Antennæ (fig. 1) 7-jointed—scape, pedical, single ring-joint, single

* More pronounced in some specimens than in others, being nearly invisible in many.

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funicle joint and a 3-jointed club; inserted slightly below (ventrad) an imaginary line drawn between the ventral ends of the eyes. Scape obclavate, longer than the combined lengths of the pedicel, ring-joint and funicle joint, straight; pedicel obconic, distinctly longer than wide, slightly longer and larger than funicle joint and about as long as the intermediate club joint, moderately stout; ring-joint distinct,

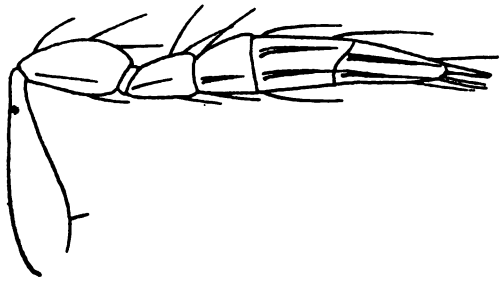

FIG. 1.—Antennæ of the ♀ *Westwoodella sanguinea* Girault, the pubescence indicated only; greatly enlarged.

minute, subquadrate or rectangular; funicle joint ovate, longer than the following joint, the 3-jointed club ovate-acuminate, pointed and widest at its proximal fourth across the base of its intermediate joint and terminating in what appears to be a long stiff dark seta*. Proximal joint of the club short, subquadrate, widening distad, the shortest antennal joint excepting the ring-joint; the intermediate club joint rectangular, longer than wide, slightly narrowing distad and slightly longer than the distal joint, the latter subequal to, but yet somewhat longer than the funicle joint. Club longer than the combined lengths of the funicle and pedicel (including the ring-joint); longer and wider than the scape. Pubescence of antennæ sparse, consisting of scattered, moderatery long cilia. Articulation of the antennæ very distinct.

From 13 specimens, ⅔-inch objective, 1-inch optic, Bausch and Lomb.

Male.—The same in general body structures as the female but very distinct in coloration, being nearly uniformly dusky yellowish, the malpighian vessels alone colored pinkish or reddish as in the general body color of the female, the eyes, ocelli and apical tarsal joints dusky and also portions of the abdomen dorsad; the abdomen more uniform in shape, ovate, rounded caudad, not conic-ovate and beneath obliquely truncate caudad as in the female. The antennæ are similar but the club is somewhat shorter and more compact, its termination not being a distinct single stiff spine-like bristle or seta but more generally hav-

* In reality two setæ, one pallid and inconspicuous.

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ing the appearance of two fine moderately long cilia. The genitalia are not exserted in death.

From 3 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Described from the following series of 16 specimens: Four females mounted in balsam and two females killed with chloroform and unmounted, captured August 25 (2), September 3 (3) and 9 (1), 1909 while running over a small window pane in an empty pig-shed on a farm at Centralia, Illinois; and 1 female mounted in balsam, captured April 30, 1910, at Urbana, Illinois while running over the glass sides of a greenhouse. And the following specimens in the U. S. Department of Agriculture collections, all mounted in balsam—3 slides as follows (see ante, *W. americana*): (1). "W. No. 1892[a]. F. M. Webster, Wooster, Ohio; Urbana, Illinois. Reared with *E. eragrostidis*. *Oligosita americana* Ashm. *Polynema citripes* Ashm." 2 ♂'s, 2 ♀'s; and 1 ♂, 1 ♀ of the renamed mymarid. (2). "Webster No. 1892. *Oligosita americana* Ashm. ♀" 1 ♂, 1 ♀. (3). "Webster No. 1892. *Oligosita americana* Ashm. ♀" 3 ♀'s.

Habitat.—United States: Centralia, Urbana, Dalton City, Butler, DuBois and Mattoon, Illinois; Wooster, Ohio; Washington, D. C.

Type.—Accession No. *41,681*, Illinois State Laboratory of Natural History, Urbana, Illinois, 1 ♀ in xylol-balsam (Centralia, Ill., Aug. 25, 1909). *Cotypes.*—Cat. No. *13,629*, U. S. Nat. Museum, Washington, D. C., 3 ♀'s in xylol-balsam, 1 slide (Webster No. 1892).

Since writing this, I have also examined 8 females captured by sweeping grass, May 25, 1910; 6 females by sweeping blue grass and wheat, May 26, 1910, Urbana, Illinois; and 10 females, same place, June 8, 1910. Also a ♀ taken from a window of a stable at Dalton City, Ill., June 15, 1910, and 1 ♂, 1 ♀ taken at DuBois, Ill., June 23, 1910 by sweeping blue grass adjoining wheat. Finally a ♀ taken July 1, 1910 by sweeping blue grass at Urbana; 1 ♀ taken at Butler, Ill., July 14, 1910; 3 ♀'s at Mattoon, Ill., July 16, 1910, the

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two latter captures on the windows of stables; and 3 ♀'s July 27, 1910 at Urbana, on the sides of a greenhouse. One of the last three females was large, twice the size of either of the others. In the National Museum collections also a tagmounted female labelled "Washington, D. C., Sep. 5, H. Barber, Collector;" and 1 ♂, 1 ♀ labelled "*Oligosita americana* Ashm.. Urbana, Ill., F. M. Webster. Bred from *Eratomocharis eragrostidis*"; and a third ♀ labelled "137" and placed with *Abbella acuminata* (Ashmead).

The beautiful red color of the females is the principal characteristic of the species but the nearly naked fore wings are also peculiar to it, the discal ciliation being sparse and very minute, nearly invisible.* The antennæ especially in the drawn-out shape of the club also differ from those of any other species known, though not to a very great extent, merely in being relatively longer.

It is clear from the labels on the slides recorded just now and in foregoing that Ashmead considered this species and *americana* to be the same, dimorphic forms of the same species but surely such characters as the marked differences exhibited in the shape and ciliation of the fore wings between the two species, not to mention the differently shaped antennæ and the fact that the males are known of both species, agreeing in detail with the females excepting in coloration, are the best specific characters obtainable for the separation of the species of any group; and in this case, assuredly, if one should hold to the opinion that these two forms were one species, actual proof should be required in the shape of breeding records that this is true. For an opinion contrary to an obvious fact requires evidence for its support. The species is most probably parasitic upon jassid eggs in wheat straw or grasses. Professor F. M. Webster has kindly written the following letter concerning them:

* In a single female of six captured at Urbana, Illinois, May 22, 1910, it was visible and distinct. This specimen also had a distinct line of cilia on the posterior wing. Otherwise, it could not be separated from the others.

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MARCH 12, 1910.

DEAR MR. GIRAULT:

Replying to your questions put forth in your memorandum of March 10, I will say that No. 1892a was reared from *Eragrostis poaoides* taken from near the Big-4 passenger station in Urbana. This, clearly, was collected July 30, 1902, on account of its being infested by Isosoma and also by Dipterous larvæ, developing to *Oscinis sorer*. The rearing of these minute parasites was entirely accidental. They simply appeared in the breeding jar, there being two colorial forms, one reddish and the other yellow. I think that both ♂ and ♀ of the red form was reared but only ♀'s of the yellow form. Doctor Ashmead determined both forms as the same species.

I also reared other specimens but I do not recall of which color form, material collected at Princeton, Ind. So far as I know, ♂'s only of the red form have been observed. The two forms emerged at the same time from the same lot of grass secured at Urbana and numbered 1892 and 1892a.

Yours truly,

F. M. WEBSTER.
In Charge of Cereal and Forage
Insect Investigations.

3. **Westwoodella subfasciatipennis** species nova.

Normal position.

Female.—Length, 0.80 mm. Tarsi 3-jointed. Fore wings with a fumated stigmal band in addition to the substigmal fuscous patch; colors inconspicuous, sordid and yellowish.

General color sordid marked with sordid yellowish, the whole of the thoracic dorsum sordid yellowish green, most of the abdomen dark, the scutellum pallid yellowish as are also the antennæ, the legs dusky, the tips of the leg joints pallid yellow as are also the two proximal tarsal joints; eyes and ocelli dark, the portion of the head surrounding the eyes with some yellowish. Fore wings nearly hyaline, with a distinct, short substigmal subquadrate, fuscous dot or dash nearly as in *americana* projecting nearly caudad (but with a distinct inclination proximad) from the knob of the stigmal vein and in addition, in the same region, a distinct though not pronounced, subtriangular fumated area forming a smoky band across the wing at the stigmal vein very much as in *subfasciata*, though not as distinct as figured for that species, the area originating at and embracing the stigmal knob and the substigmal dash and proceeding caudad across the disk of the wing to the caudal margin where it is broadest. Proximad, caudad of the submarginal vein there is also some duskiness, more visible at the distal end of the submarginal vein. Blade of the posterior wing dusky, indistinctly maculate. Venation concolorous with the antennæ. Distal tarsal joint dusky.

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Fore wings nearly as broad as in *americana* broader than those of *subfasciata* as figured or of *sanguinea*, the longest marginal cilia distinctly shorter than the greatest wing width which is a little more than half way distad of the distance between the stigmal knob and the wing apex; whereas in *subfasciata* as figured and *sanguinea* the longest marginal cilia are about equal to the greatest wing width which is still more than half way distad between the stigmal knob and the wing apex; in *americana* these arrangements are very similar to those described for this species, but the fore wings are still broader in relation to the length of the longest marginal cilia. Discal ciliation of the fore wing somewhat as in *americana* but somewhat less conspicuous, the individual cilia somewhat smaller, the whole consisting of about nine longitudinal lines across the widest portion of the wing; the discal ciliation extends back to the stigmal knob, to a point caudad of it, and proximad, caudad of the marginal vein, at its center nearly, in the center of the wing, is a longitudinal row of three or four cilia. Marginal cilia longest disto-caudad, on the caudal wing margin extending around to a point slightly proximad of a point opposite (caudad) the stigmal vein. Posterior wing normal, acute at the end of the marginal vein where three hooklets arise, its blade acuminate, bearing one principal line of discal cilia extending the whole length of the blade, nearer to the cephalic than to the caudal margin and as usual the line of discal cilia arising near the cephalic margin between the bases of the marginal cilia; this line of cilia is not, however, directly at the cephalic margin and is minute and inconspicuous; it is not present along the caudal margin of the wing ($\frac{1}{8}$-inch objective). Marginal cilia of the posterior wing minute, uniform, inconspicuous on the cephalic margin, as is usual, but at the wing apex and along the caudal margin very long, longest at the center of the caudal margin, nearly as long there as twice the greatest wing width and nearly as long as the longest marginal cilia of the fore wing. Venation normal to the genus, the long straight marginal vein subequal to or slightly longer than the submarginal vein, the short rounded stigmal vein nearly sessile, the knob rounded, thickened and with a small usual uncus. Postmarginal vein absent.

Legs normal, the proximal tarsal joint subequal to the distal joint of the tarsus, the intermediate joint somewhat shorter. Tibial spurs of intermediate and posterior legs minute, in the first apparently single, straight. Tibial spurs of posterior legs apparently double. Antennæ similar to those of *americana* or nearly.

From 1 specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—The same; antennal club somewhat more compact, shorter; abdomen rounded caudad.

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From 1 specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Described from one male and one female mounted in balsam, received through Dr. L. O. Howard and labelled respectively "3969[w]. Wheat. Jassidæ. Pullman, Wn., 18 October, 1909. Reared from green eggs. G. I. R." (♂); and the same data "13 September, 1909. Reared from yellow eggs." (♀).

Habitat.—United States: Pullman, Washington.

Type.—Type No. *13,630*, United States National Museum, Washington, D. C., 1 ♀ in balsam.

Cotype.—Accession No. *44,191*, Illinois State Laboratory of Natural History, Urbana, Illinois, 1 ♂ in balsam.

Professor F. M. Webster has kindly furnished me the following notes concerning this species:

"3969. Jassidæ. Det. Herbert Osborn.
Wheat. Pullman, Wash. Coll. Geo. I. Reeves.

April 10, 1908.—Collected many brown and a few green Jassids in wheat stubble and volunteer wheat, by sweeping. Found eggs in masses of 2 to 5 in net, and found that they came from areas where only stubble was, as well as other areas. Examining stubble found eggs tucked under edge of sheath, often indicated externally by slight lifting of the edge, sometimes showing ends of eggs which lie side by side perpendicular to edge of sheath, lightly stuck together and slightly or not at all adhering to sheath. Usually 4 to 10 in one straw, sometimes more, always above topmost node of stubble. Eggs pale red and green opalescent, club shaped with sort of pedestal at edge nearest edge of sheath. Collected eggs and stems to rear and photograph.

Sept. 13, 1909.—Collected Jassid eggs in wheat stubble, in third field north of Mr. Priest's orchard on Military Hill. There are two kinds of eggs, one the same as those studied and photographed April 10, 1908, the other brown, with no distinct micropylar armature, placed similarly to the former but less regularly. Rear and describe. Swept 2 adults from the same spot. The eggs were collected not on the stubble itself but on green and partly green second growth shoots.

Sept. 14.—Observed two insects within eggs collected Sept. 13 cutting round holes like some that were observed in the eggs when they were collected; time, 10:23 a.m. Issuance from egg completed, 11:12 a.m. This parasite was determined by Crawford as the trichogrammid *Oligosita* sp.

Oligosita sp.: General color pale green; abdomen pale yellow; ocelli and eyes reddish-brown; stigmata dark brown; antennæ, legs,

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hairs on wings and marks on pleuræ, fuscous. Dimensions (c=0.0333 mm.): Entire length 19c.; length of head 3 c, thorax 7c, abdomen 11c, antennæ 4 c (measured alive, hence not consistent), width of head 5c, thorax 5c, abdomen 5c. See drawings by Hyslop.

The rows of yellow eggs are inserted between the sheath and its own inner epithelium and each egg is enclosed in a delicate glue-like case which adheres to the epithelium. The eggs are imprinted with the striæ of the stem where they rest against it. Color pale yellowish-brown. No micropylar structures. Length 0.97 mm., width 0.21 mm.

Jan. 6, 1910.—Hyslop writes from Washington that the alcoholic and balsam specimens which he took to Washington have been turned over, with those of the National Museum, to Mr. Girault."

4. **Westwoodella comosipennis** species nova.

Normal position.

Female.—Length, 0.75 mm.

This species is closely related to both *americana* and *subfasciatipennis* in having the greatest width of the fore wings distinctly greater than the length of the longest marginal cilia of the fore wing, in having the general shape of the fore wings similar and in habitus but differs from both in its distinct discal ciliation, the discal cilia longer, moderately dense, conspicuous; besides this the fore wings are uniformly and somewhat more noticeably clouded throughout and there is a slight stigmal fuscous dash (as in the others) which is dart-shaped, giving the knob of the stigmal vein an acute, spine-like prolongation apparently; this stigmal spot points more caudad, less proximad, than that in the other two species and the stigmal uncus is decidedly stronger, pointing directly distad. There are still other differances, for instance the proximal club joint being longer than wide and the caudal tarsal joints distinctly slenderer.

General color deep-orange yellow, the legs yellowish-brown excepting the distal tarsal joint and the lateral aspect of the caudal coxæ and femora which are dusky black; eyes dark garnet. Antennæ and the venation concolorous with the legs. Caudal tarsal joints slender, the proximal longest, nearly twice the length of the distal joint, the intermediate joint also long and slender, a fourth shorter than the proximal joint which is about ten or more times longer than wide. Intermediate tarsal joint of the caudal legs distinctly longer and slenderer than the distal joint. Otherwise as in *americana*. (Mandibles with at least two distinct teeth.)

Male.—Unknown.

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Described from two female specimens in the U. S. National Museum collection, tagmounted and labelled "6745. Ithaca, N. Y. June 5–10–95", 1 ♀, and the other "*Trichogramma.*" The former is the type, the latter the cotype specimen. Remounted in balsam, two slides. Description from the balsam mounted specimens.

Habitat.—United States: Ithaca, New York.

Type.—Type No. *13,631*, United States National Museum, Washington, D. C., 1 ♀ in xylol-balsam.

Cotype.—Accession No. *44,187*, Illinois State Laboratory of Natural History, Urbana, Illinois, 1 ♀ in xylol-balsam.

5. **Westwoodella clarimaculosa** species nova.

Normal position.

Female.—Length, 0.65 mm.; moderate for the genus. Similar to *comosipennis* in coloration but agreeing with *sanguinea* and *subfasciata* in having the narrower pattern of fore wing the greatest width of which is about equal to the longest marginal cilia of the fore wing. The substigmal spot of the fore wing is dense and clear cut, crescentric, its cephalic end involving the knob of the stigmal vein; besides this smoky spot, the part of the fore wing immediately surrounding it is slightly clouded, the cloudiness extending to the caudal wing margin; and proximad there is also a clouded streak across the narrow portion of the wing at the distal bend of the submarginal vein. The discal ciliation of the fore wing is sparse as in *sanguinea* but distinct not ap-apparently absent, minute, as in that species. The fore wings are somewhat wider than in that species. The posterior wings have one complete longitudinal line of discal cilia (excluding the line of minute cilia at the cephalic edge). The antennæ are built as in *sanguinea* and together with the legs are similarly colored; the antennal club terminates in a long spine. The mandibles have at least two teeth, both of which are strong and distinct. Proximal joint of posterior tarsi long and slender, distinctly longer than either of the two distal joints. Eyes naked. Cephalic tibiæ without tibial spurs, the spurs of the posterior tibiæ single. As with the other species with the exceptions as noted.

From a single specimen, ⅔-inch objective, 1-inch optic, Bausch and Lomb.

Habitat.—United States: Pulaski, Illinois.

Type.—Accession No. *44,193*, Illinois State Laboratory of Natural History, Urbana, one female in xylol-balsam.

Captured by sweeping along the margin of a cypress swamp (C. A. Hart and A. A. Girault).

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Genus **POROPŒA** Foerster.

1. **Poropœa attelaborum** species nova.

As both sexes of this genus are well known and do not differ excepting in the secondary characters present in the antennæ and abdomen and also since the host of this species is definitely known I do not hesitate in describing it from this single male specimen.

Normal position.

Male.—Length, 1.05 mm.; moderately large, short, robust. General color shining black; meson of scutellum yellowish, forming an acuminate sagittate yellow mesal area with its truncate base cephalad and with its slender acute apical end caudad. Eyes dark garnet. Head wider than the thorax, the vertex thin, acute, wide, the mesonotum large, nearly as long as the remaining portions of the body combined, slightly convex, with no median carina or impression, the median line smooth, the deep parapsidal furrows very widely separated, in the dorso-lateral aspect. Scutellum distinct, rounded in outline, convex, but shorter than the long scutum. Dorsum of the thorax distinctly reticulated and shining, the sculpture moderately coarse, not punctate. Abdomen very short, triangular, acute, nearly hidden (dorsal aspect); short, subquadrate (lateral aspect). The proximal two tarsal joints and the apex of the tibiæ white, the distal tarsal joint black. Eyes dark garnet. Face reticulated. Cephalic knees and the caudo-lateral aspect of the cephalic tibiæ honey-yellow. Lateral ocelli their own width from the eye margins. Wings wholly hyaline, the venation pallid yellow. Eyes coarse, the face concave. Antennæ inserted slightly ventrad of the middle of the face, distinctly dorsad of an imaginary line drawn between the ventral ends of the eyes, the scape long, slender, reaching up as far as the cephalic ocellus. Ocelli in a mere curved line, nearly in the cephalic aspect. Body short, robust, somewhat humped. The tibial spurs single, the tarsal claws present but concealed from above.

Fore wings transparent, clear, so clear that they are barely visible in balsam mounts, the yellowish venation of the fore wings, however, distinct, exactly as figured by Foerster (1851) for the type species but less regular in outline; the arch formed by the venation is much broader, its true apex pointed more disto-cephalad and there acute, with a seta at its extremity; the stigmal vein is long, slender, narrowing distad until the ovate knob is reached and the latter is not turned back upon the neck of the vein but is a direct continuation and termination and besides bears a distinct uncus like a tooth; the knob of the stigmal vein is moderately large. The venation of the fore wing bears about six distinct setæ widely separated, unequal in length and from distinct setigerous spots; these are borne by the marginal vein and the

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distal and proximal ends of the submarginal and stigmal veins respectively. The marginal vein does not touch the costal wing margin but nearly does so. The marginal fringes of the fore wing are about as figured for the type species and the wing is broad, its broadest portion at the distal fifth, far distad from the end of the venation and there are about twelve longitudinal lines of discal cilia, the lines distant from each other and the ciliation colorless, not clearly visible at all excepting with the brightest of lights and then but faintly. Apparently very similar to that of the type species.

From 1 specimen, ⅔-inch objective, 1-inch optic, Bausch and Lomb.

Described from a single male specimen formerly tag-mounted now remounted in balsam, from the U. S. National Museum collection, Washington, D. C., labelled as follows: "Poropeus sp. from eggs of *Attelabis analis*".

Habitat.—United States (east).

Type.—Type No. *13,632*, United States National Museum, Washington, D. C., 1 male in xylol-balsam.

Girault (1907 b) records a *Poropœa* from the eggs of *Attelabus bipustulatus* Fabricius and the record may refer to the above specimen; but I have reason to think otherwise. I remember seeing at least one of the specimens of that record in Dr. A. D. Hopkins' office and if my recollection is right, it was mounted in balsam. Dr. Hopkins was the one who reared it and according to him the specimens cannot be found now.

Genus **LATHROMERIS** Foerster.

1. **Lathromeris fidiæ** (Ashmead).

Brachysticha fidiæ Ashmead—Webster, 1894–1895, p. 169.
Brachysticha fidiæ Ashmead, 1894–1895, pp. 171–172.
Brachystichta fidiæ Ashmead—Webster, 1896, p. 69.
Brachista fidiæ Ashmead—Girault, 1907 b, p. 29.
Brachista fidiæ Ashmead—Schmiedeknecht, 1909, p. 482.
Lathromeris fidiæ (Ashm.)—Johnson and Hammar, 1910, pp. 51, 56–57, fig. 27.

An examination of some trichogrammatines recently reared from *Fidia viticida* at North East, Pennsylvania, the host from which this species was originally described, leads to the belief that they are really *fidiæ* and if so that species was wrongly described.

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I am unable to separate these specimens generically from the type of *Lathromeris cicadæ* Howard. As far as can be determined the antennæ are similar, bearing the characteristic 4-jointed club and the minute ring-joint and the wings are very similar having the same venation and ciliation, the discal cilia in regular longitudinal lines but not very conspicuously so.

Originally the species was described exactly as quoted herewith.

"*Brachysticha fidiæ*, sp. n. ♀.—Length 0.65 mm. Head, except eyes and thorax, pale brown or brownish-yellow; the conical-shaped but depressed abdomen dark fuscous or black; wings hyaline, broad, pubescent, with a short marginal fringe, the pubescent not arranged in regular rows; legs brown or fuscous, the tips of femora, tips of tibiæ and tarsi yellowish.

The head antero-posteriorly very thin, with a facial impression; the antennæ inserted far down on the face, 6-jointed (scape, pedicel, ring-joint and a 3-jointed, fusiform, pubescent club); thorax with a longitudinal median impressed line; while the abdomen is long, conically-pointed, but depressed above.

Hab.—Euclid, Ohio.*

Described from specimens bred by Prof. F. M. Webster, August, 1894, from the eggs of *Fidia viticida*, on grape-vine.

This species comes nearest to *Trichogramma acuminatum*, Ashm., Can. Ent., 1888, p. 107, which should probably be referred to this genus, but differs decidedly in the color of the legs and abdomen." Pp. 171–172.

From the five male specimens mentioned in foregoing I add the following important descriptive details:

Normal position.

The club of the antennæ is 4-jointed, the joints obliquely truncate, the first joint subhemispherical, obliquely truncate distad, longest and broadest, the second joint wedge-shaped or triangular, wedged in between the first and third joints, obliquely truncate at both ends, the base and apex converging, about equal in shape and size to the third joint, which, however, has its apex and base converging in the opposite direction the two joints being complementary, the pointed end of the third joint on the side opposite to that end of the second joint; fourth or distal joint slightly shorter, obtusely conical, its base however obliquely truncate. The ring-joint is abruptly minute but yet distinct. The scape is about equal to the club in length and is cylindrical but

* End of p. 171.

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broadened slightly at its middle; pedicel stout, somewhat over one-half as long as the scape or club but narrower than the club, conic, broadest at apex; club long-ovate. Pubescence sparse, consisting of scattered long setæ on the apical two club joints, several less conspicuous whorls on the proximal half of the club and a few scattered setæ on the pedicel.

Fore wings as in the male of *Lathromeris cicadæ*, as far as the marginal ciliation is concerned and other characters but the stigmal vein is more sessile and somewhat more stout; the discal ciliation is arranged in about 18 lines across the greatest wing width which is at the distal sixth of the wing; the discal ciliation is moderately dense, but the majority of the lines are plainly in regular rows; there is no oblique line running proximo-caudad from the end of the stigmal vein. Posterior wings also similar to those of *L. cicadæ*. Legs dusky, tarsi pallid. Tibial spurs single.

Two-thirds inch objective, ⅜-inch optic, Bausch and Lomb.

The foregoing notes were made from the following specimens received from Professor A. L. Quaintance through the kindness of Dr. L. O. Howard, all labelled as follows: "Fidia viticida. Parasitized by dipterous insect, possibly secondary. North East, Pa. A. G. Hammar. Col. Aug. 30, 1909. Bred Feb. 1910."—2 ♂'s (1 slide), 2 ♂'s (1 slide) and 1 ♂ (1 slide). The specimens were all mounted in balsam.

Since, I have examined the type in the National Museum collection. They consist of two tagmounted specimens labelled "Type No. 1448, U. S. N. M. Ohio. Brachista fidiæ Ashm." One male, one female; the former without name label but with the additional number "1796"; the female specimen missing. the ♂ specimen was in poor condition only a portion of the fore wing remaining which showed the venation of the specimens mentioned in foregoing. There can be but little doubt that the species is correctly defined here.

Habitat.—United States: Euclid, Ohio and North East, Pa.

2. **Lathromeris cicadæ** Howard.

Lathromeris cicadæ Howard, 1898, pp. 102–103.

Lathromeris cicadæ Howard—Marlatt, 1898, pp. 97–99, fig. 42, a–d.

Lathromeris cicadæ Howard—Girault, 1907 b, p. 31.

Lathromeris cicadæ Howard—Marlatt, 1907, pp. 130–132, fig. 53, a–d.

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I quote the original description of this species by Howard (1898) exactly as it was published.

"**Lathromeris cicadæ,** new species.

Female.—Length, .74 mm.; expanse, 1.48 mm.; greatest width of fore wing, .21 mm. Body long and slender, abdomen acuminate and longer than head and thorax together; antennæ short, clavate, scape rather stout, pedicel still stouter and half as long as scape, ring-joint very minute, almost imperceptible, club stouter than pedicel and as long as scape, compact but rather plainly divided into 4 subequal joints, the apical one being slightly the longest, fusiform in shape and with rather long delicate hairs, especially toward the tip; wings ample, with short marginal cilia; stigmal vein not curved and extending into disk of wing at an angle of about 45 degrees from costa. Colour sordid yellowish, occiput black; pronotum dusky, black at sides; abdomen dark at sides; eyes coral red, almost claret coloured; antennæ slightly dusky.

Male.—Slightly shorter than female; abdomen with parallel sides and rounded at tip; antennæ with a dark blotch at base of club.

Described from two males, two females, reared from eggs of *Cicada septendecim*, collected by T. Pergande, in Virginia, just across the Potomac River from the City of Washington, in July, 1895. All four specimens mounted on a single slide. Type No. 3850, U. S. Nat. Mus." Pp. 102–103.

In the same year of its original description it was figured by Marlatt in his bulletin on the Periodical Cicada and later again by the same author (Id., 1907); both accounts, including the figures are identical. Girault (1907 b) listed the species from its only host, *Cicada septendecim* Linnæus.

Through the kindness of Dr. Howard, whose original description of the species has just been quoted, I have been able to examine the type specimens of this species from the United States National Museum. The species is exactly as is described (Howard, 1898) and figured (Marlatt, 1898, 1907), though in the figure the submarginal vein of the fore wing is drawn somewhat too broad. From the four type specimens I add herewith the following supplementary descriptive details:

In the female the antennal club is distinctly longer and less stout than in the male as figured, but one antenna of one of the females on the type slide has the club shaped exactly as in the two males of the type,

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and on the other hand, one of the male antennæ is noticeably more slender than the others though not as slender and as long as any of the female antennæ. Caution should therefore be taken in considering this secondary sexual character as the differences may be due to different antennal aspects or to the mount. I hardly believe this to be true, however, for everything here leads to the belief that the differences are real and true ones and they certainly agree with Arnold Foerster's description of the male of the genus. The segmentation of the antennæ is now indeterminable in two of the specimens of the type, a male and a female, but in the remaining male and female it is quite as described. The pubescence of the antennæ is the same in both sexes; the ring-joint is perceptible though exceptionally minute and narrow; the scape in the male is somewhat shorter than in the female and slightly dilated distad and ventrad. Fore wings moderately broad, built somewhat as in *Ufens* Girault but not pronouncedly broadened distad, its apex regularly convexly rounded, broadest at the point about midway between the distal end of the stigmal knob and the wing apex, its marginal cilia short and close but not exceedingly dense and becoming distinctly longer at the extreme disto-caudal apex of the wing, there about thrice the size of the other marginal cilia but not long, short as compared to the apical marginal cilia of the genus *Abbella* Girault for instance; in the male, however, these longer cilia extend around the whole wing apex, and hence the marginal cilia of the fore wing of the male cannot be described as short but moderately short, shorter for instance than those of *Trichogrammatoidea* Girault.

The marginal cilia of the posterior wings are short, minute, uniform on the cephalic wing margin but moderately long on the caudal wing margin, there centrally being longest, distinctly longer than any of the marginal cilia of the fore wing, their greatest length slightly shorter than the greatest width of the posterior wings at the distal end of the marginal vein; the end of the marginal vein bears three pale spine-like hooklets. The posterior wing is broad, subobtuse at apex but the blade acuminate. Discal ciliation of the fore wing moderately dense, short, arranged in regular lines but not very distinctly so some of the lines being confused; there are from 16 to 20 lines of them counting around the apex from the end of the venation. A subtriangular portion of the discal ciliation extends proximad past the stigmal knob, entering the usual naked wing portion caudad of the marginal vein. Discal ciliation of the posterior wing consisting of two well defined parallel longitudinal lines near to the cephalic wing margin in the blade and a third fainter line nearer the caudal wing margin and extending farther proximad; the cephalic and caudal lines are not especially near the edges of the wing between the insertions of the marginal cilia but from their general appearance and position are evidently homologous with the lines of cilia usually present there. Submarginal vein of fore wing distinctly longer than the marginal, straight,

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narrow, then suddenly broadening to the width of the marginal and curving up to it; the marginal vein straight, broad, broken at the place where it is joined by the submarginal by a colorless area, one and a half times longer than the stigmal vein, moderately long, obliquely truncate distad, the caudal angle of the truncation bearing the clavate, nearly straight stigmal vein which bears the usual uncus and has a very short petiole. There is no oblique line of discal cilia running proximo-caudad from the stigmal vein. Both sexes colored alike; lateral ocelli distant from the eye margins. Median line of mesoscutum lighter in color; also the postscutellum. Wings hyaline. Body sculpture very slight reticulation.

The slide bearing the 2 male and 2 female type specimens is in excellent condition as are also the specimens themselves, and besides the type number label of the U. S. National Museum and a label bearing the name of the insect in Dr. Howard's handwriting, there is also a small label bearing the number "246[06]".

In the National Museum collections I have also found seven tagmounted specimens of this species, so labelled in Dr. Howard's writing, each specimen bearing the additional label "246[06]. From eggs of Cicada? Issued July 29, '85." All of these specimens have been remounted in balsam and studied. Very little could be obtained from them otherwise. They bear out the foregoing descriptive matter.

Genus **CENTROBIA** Foerster.

1. **Centrobia odonatæ** Ashmead.

Centrobia odonatæ Ashmead, 1900, pp. 616–617.
" " " —Needham, 1903, p. 230.

"(4) *Centrobia odonatæ* n. sp.

♀.—Length, 0.8 mm. Black, slender, the abdomen much acuminate, ending in a prominent ovipositor. Mouth parts brownish-yellow. Antennæ short, 6-jointed without a ring-joint, brown-black, the flagellum tapering off at apex, not ending in a distinct club. Wings hyaline, the pubescence arranged in radiating rows, the margins with a distinct but short cilia, the marginal and stigmal veins brown the latter oblique, shorter than the marginal. Legs brownish-yellow, the femora more or less obfuscated. Abdomen elongate, sessile, strongly acuminate towards apex and more than twice longer than the thorax.

Hab.—Lake Forest, Illinois.

Type.—Cat. No. 5321, U. S. N. M.

Host.—Odon.: Eggs of *Lestes* sp. Bred August 12, 1900, by Prof. James G. Needham." Pp. 616–617.

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I have examined the types of this species in the United States National Museum consisting at the time of two tag-mounted females bearing the following labels: "*Centrobia odonatæ* Ashm. ♀ type."; "Type No. 5321, U. S. N. M."; and "8604[05]. Aug. 12, '99." The following descriptive notes were taken from them:

The fore wings have moderately short marginal fringes, the discal ciliation moderately dense but arranged in regular radiating lines, the abdomen conic-ovate, longer than the head and thorax taken together and attenuate caudad into an exserted ovipositor as long as, or slightly more so, the half-length of the abdomen; marginal and submarginal veins straight, the latter much longer than the former; postmarginal vein absent. Stigmal vein short but not sessile, well defined, straight, not quite half as long as the marginal vein. Wings shriveled. Body with a scaly surface. Antennal club 3-jointed, long acuminated, the funicle 1-jointed; not able to see the other joints.

The specimens were somewhat shriveled. In addition to the types as found originally, stated in the preceding lines, there has also been made a balsam slide from one of them bearing a female antenna and labelled "Hym. slide No. 111" (U. S. N. M.).

Genus **CHÆTOSTRICHA** Haliday.

1. **Chætostricha flavipes** (Girault).
Paracentrobia flavipes Girault, 1905, pp. 287–288.

A re-examination of the types of this species shows that the antennæ were wrongly described as bearing a ring-joint. The following descriptive details are added from them:

The parapsidal furrows are complete; ovipositor not exserted; abdomen short, conic-ovate, pointed from lateral aspect; lateral ocelli distant from the eye margins. Antennæ (fig. 2) clavate, the joints

FIG. 2.—Antenna of the ♀ of *Chætostricha flavipes* (Girault), the pubescence omitted; greatly enlarged.

irregular in shape in relation to each other, 6-jointed—scape, pedicel, one funicle joint and a 3-jointed club, the segmentation distinct, the ring-joint absent. Fore wings (fig. 3) broad and short, at their widest point nearly two-thirds their length, very broadly oblately rounded at

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the apex, the lines of the discal ciliation peculiarly distinct, the ciliation dense, the cilia short, the marginal cilia short and close; marginal vein short and stout, the stigmal vein neckless, thick, about half the length of the marginal vein and placed nearly at right angles to it, both taken together resembling a short stout rough walking-stick of which the stigmal vein would form the handle; the marginal vein widens distad; it is shorter than the submarginal vein and both are straight. Caudal wings with the blade also shorter and broader than usual, the discal ciliation consisting of five longitudinal lines of cilia all about equal but the third and fourth lines are somewhat confused;

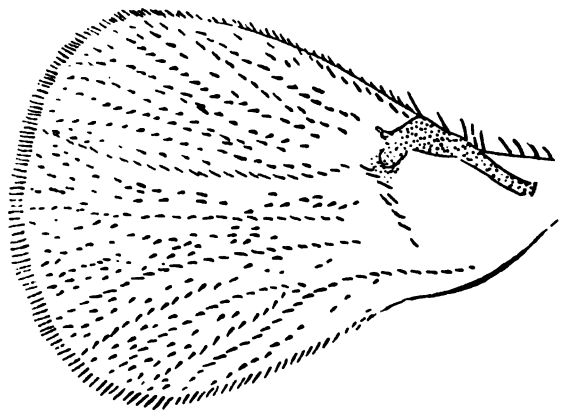

FIG. 8.—Fore wing of the ♀ of *Chætostricha flavipes* (Girault), the extreme base omitted. Discal ciliation indicated only; greatly enlarged.

the marginal cilia of the caudal margin of the posterior wing is not as long at their longest as the greatest width of the wing blade, the cephalic margin of the blade straight, the caudal margin broadly convex. Fore wings with a line of about seven discal cilia running obliquely proximo-caudad from the extreme apex of the stigmal vein, bare proximad of that line in the center. The male antennæ do not differ from those of the female. The funicle joint is stout, as wide as the club. The fore wings are very slightly fumated proximad. The tarsal claws comparatively prominent.

In the National Museum there are one male and one female tagmounted type specimens the former labelled "*Paracentrobia flavipes* Girault. Type No. 8942, U. S. N. M. J. H. Beattie, collector. Fort Valley, Georgia, VI. 12. 05., ♂. No. 90." The female is labelled simply "type No. 8942, U. S. N. M., ♀." The "No. 90" of the first specimen is simply a private number. In my own collection I find three slides

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of this species, two of them labelled "90", a male and a mount of the female head; they emerged at Washington, D. C., June 23, 1905 from material collected several weeks previously at Fort Valley, Georgia. The third specimen is a female in balsam labelled "91" and "*Paracentrobia*) *Chaetostricha flavipes* (Girault). U. S.—Georgia. ♀ cotype." Reference to the number 91 in my notebook shows that this specimen issued on June 25, 1905 from the same lot of material. It has been deposited in the collections of the Illinois State Laboratory of Natural History at Urbana and given the accession No. *44,194*.

Genus **ABBELLA** Girault.

1. **Abbella acuminata** (Ashmead).

Trichogramma acuminatum Ashmead, 1888, p. 107.
? *Brachysticha acuminata* (Ashmead), 1894–1895, p. 172.
Brachista pallida (Ashmead), 1900, p. 616.
Brachista pallida (Ashmead)—Needham, 1903, p. 230.
Brachista acuminata (Ashmead)—Schmiedeknecht, 1909, p. 482.

Normal position.

Female.—The same as *Ittys ceresarum* (Ashmead) in general aspect and all characters but differing from it in the following: About a third smaller, moderately large in size; the general color is pallid greenish yellow (blue green) with the occiput, pronotum (excepting the caudal third) and much of the thoracic pleura velvety black, the velvety black bands of the abdomen indicated along the sides only, not completely crossing the abdominal dorsum; the fumated spot of the fore wing, the substigmal spot, is a crescentric black spot placed like a continuation of the stigmal vein and not reaching farther caudad than half-way to the caudal wing margin or slightly more than half-way; the rest of the fore wing is practically hyaline; the fumated substigmal spot nearly clear cut not diffused across the wing as in the species mentioned; it is also darker in color.

In structural characters, the antennæ differ in being relatively shorter, the scape and club shorter but the pedicel about the same size, very much larger than the funicle joints taken together; the funicle joints are smaller, both being wider than long, the second funice joint only about half the length of the first and flat somewhat like a ring-joint; the latter is distinct; the club is the same but shorter, more ovate-conic. Antennæ bearing scape, pedicel, ring-joint, two funicle joints and three club joints. The fore wings differ in the minute details of the venation, mostly in regard to the size of the stigmal vein and the discal cilation. The stigmal vein is distinctly shorter and nearly with-

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out a distinct neck being more uniform in width and the apex truncate, not especially broadened, the uncus acute, arising near the apex and casually, making it appear to be broadened and sharpened at one end. Further, the fore wing is narrower, the venation does not reach half-way to the extreme apex as it does in the other species and the discal ciliation is denser and more uniform, does not extend proximad of the distal end of the stigmal vein and the oblique line of cilia running proximo-caudad from the stigmal vein, prominent in the other species, is absent here. The discal ciliation is nearly normal but 3 or 4 lines strictly being in regular rows longitudinally. The posterior wings are narrower, with nearly parallel margins, slender, not moderately stout; otherwise the same but the caudal line of discal cilia is slightly more distinct, the cilia somewhat closer in the line. Mandibles with three acute teeth.

From 1 specimen, $\frac{3}{8}$-inch objective, 1-in choptic, Bausch and Lomb.

Male.—Unknown.

Redescribed from a single female specimen taken on the glass sides of a greenhouse on the campus of the University of Illinois, Urbana, Illinois, April 30, 1910. Since drawing up this description I have captured, on the small windows of stables, a female at Litchfield, Illinois, July 13, 1910, and one at Butler, Illinois the day following (see following).

Habitat.—United States: (Lake Forest, Urbana and Butler) Illinois.

Types.—Type No. *13,633*, United States National Museum, Washington, D. C., 2 slides, 2 ♀'s and ♀ head in xylol-balsam respectively, both originally on tags labelled "134," and "*Trichogramma acuminatum*"; also 1 homotype ♀ in xylol-balsam (Litchfield, Illinois, July 13, 1910). The original specimens are less fit for study than the homotype. *Cotype.*—Accession No. *44,192*, Illinois State Laboratory of Natural History, Urbana, Illinois; 6 ♀'s in xylol-balsam, labelled "134" and "3756°, Iss. Sep. 10, '85", all on a single slide remounted from tags; also a ♀ head in xylol-balsam taken from the other specimens. Also a homotypical ♀ bearing the same number (Urbana, Illinois, Apr. 30, 1910).

I first became acquainted with the species during April, 1910, when a single female was captured. The species was

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thought to be new and was arranged with *Ittys* Girault. However, I am now convinced that it either belongs to *Abbella* Girault, or else is generically new; it agrees with *Abbella* excepting in wing ciliation, the fore wings normally densely ciliate with moderately long marginal cilia, and in the shape of the body, the abdomen being long and pointed. For the present I leave it with this genus but may transfer it to another subfamily if in my opinion the present subfamilies are good; it will then form a new genus.

The identity of this species did not become known to me until several months after I had captured the first specimen of it when I positively identified it with (*Trichogramma*) *Brachysticha acuminata* (Ashmead), the original specimens of which, together with another, larger series, were found in the National Museum collections. The species was erroneously described as a *Trichogramma* by Ashmead (1888) exactly in this manner:

"(19) *Trichogramma acuminatum* n. sp.

Female, length .03; male, .02 inch. Honey-yellow; eyes purplish-brown; legs pale or white. The abdomen in the female is acuminate-ovate, about twice as long as the head and thorax combined, with a lateral and a ventral row of five or six brown spots. In the male the abdomen is obtuse behind, not longer than the head and thorax combined. Antennæ pilose. The wings are strongly ciliate, the fore pair broadly rounded with a dusky blotch beneath the stigma, the hind pair rather narrowed and pointed at apex.

Described from two female and one male specimens, reared from a corn-leaf, and probably parasitic on the eggs of some leaf miner." P. 107.

In 1895 (Ashmead, 1894–1895), Ashmead referred the species questionably to *Brachysticha* Foerster (= *Brachista* Haliday) when describing (*Brachysticha*) *Lathromeris fidiæ* (Ashmead); since, the species has remained in that genus but does not belong there as has already been intimated. Some years later Ashmead (1900) described a *Brachista pallidæ* which I am nearly certain is the same species which we have under consideration as the following account will show; at the least it is congeneric with *acuminata* and very similar to it but there were some difficulties in accurately examining the single tagmounted type of *pallida*.

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During the late summer of 1910 I visited the National Museum collections and found therein three female specimens of this species mounted side by side on a card labelled "*Trichogramma acuminatum* Ashmead" in the well known handwriting of Dr. Ashmead and from these specimens I took the following notes :

Congeneric with *Brachista pallida* Ashmead. Wings similar to those of that species as is also the shape of the body, the abdomen long, slender, conic-ovate, longer than head and thorax united. Antennæ 8-jointed, as in *Ittys*—scape, pedicel, 1 ring-joint, 2 funicle joints and a 3-jointed club. Venation straight, marginal and submarginal veins about equal, the short stigmal vein with an ovate, fuscous spot leading from it; fore wings with about 17 longitudinal lines of discal cilia; marginal cilia moderately long at apex; no oblique line of discal cilia leading back from the stigmal vein. Posterior wings with two principal lines of cilia, the caudal line fainter and with its cilia farther apart in the line; in addition to the lines along both wing edges. Parapsidal furrows complete. Fore wings long and but moderately broad. Mesoscutum and scutellum bright pale lemon yellow, contrasting with the darker, soiled brownish of the rest of the body, the distinguishing characteristic of the species (i. e. in *re pallida*); *pallida* is uniform in general ground color. Otherwise the two species are similar. (Cf. 7 specimens labelled "134" and also "Brachista fidiæ.")

These undoubted original (not type, not so designated or labelled*) specimens were compared with a larger series of other specimens (mentioned and listed beyond) found in the same collection and these in turn were brought to Urbana, remounted in balsam and compared at leisure with the specimens captured in Illinois; all were identical. At the same time that the original specimens of *acuminata* were examined, as alread intimated, I also examined the types of *Brachista pallida*, of which only one specimen of the original two tag-mounted types remained intact. The two type tags were labelled as follows: "8694[02]. Aug. 12, '99. Type No. 5320. *Brachista pallida* Ashm. ♀ type." for the one and the other the same and this "From eggs of Lestes, Lake Forest, Ill., Aug. 4, '99." From the first specimen, which was intact (the other was entirely missing) I made a balsam mount of

* But now remounted in xylol-balsam and deposited as types as stated in foregoing.

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an antenna (Hym. slide 110, U. S. N. M) and obtained the following notes:

Cf. *acuminatum*. Wings as in *Ittys* Girault but densely ciliate, without regular longitudinal lines of discal cilia. Body long and slender as in *Ittys*, the abdomen longer than the head and thorax together, conic-ovate. Marginal and submarginal veins long and slender, subequal, the stigmal vein sessile, rectangular, a slight fuscous dash from it; otherwise wings hyaline; marginal fringes moderately long, Posterior wings slender, *apparently* with two principal lines of cilia, complete and additional to the line along each edge. Ocelli in an equilateral triangle in the center of the subquadrate vertex, the lateral ones distant from the eyes. Legs normal; ovipositor not exserted. Antennæ—scape, pedicel, one ring-joint, a single globular funicle joint and a 3-jointed club. Pedicel long obconic, thrice the length of the funicle joint, thrice longer than wide, over half the length of the club; the single ring-joint concealed but plainly evident when the antennæ are extended; the single funicle joint short, globular to suquadrate, a little over half the length of the proximal club joint; club acuminate, as long as the pedicel and funicle united, the three joints subequal in length. Antennæ with sparse long setæ. No oblique line of discal cilia leading back from the stigmal vein.

In regard to the sameness of *acuminata* and *pallida*. In the first place to give the reasons for considering them the same, the original descriptions of both will have to be disposed of, because a comparison of them will show that they do not agree, intimating of course that the species are distinct. Now if these original descriptions are compared with the descriptive notes taken from the original specimens themselves and with the whole description of the species *acuminata* given above—of course conceding the latter to be correct—it is obvious that both of them are erroneous and inadequate.

Secondly, conceding the proposition just made, then we must take at once the evidence furnished by the types:

1. The types were at once recognized to be congeneric and very similar.
2. The only specific difference observed between the types was a darker ground color of the mesoscutum in *pallida*, a very small difference indeed when one takes into consideration how often differences occur in individuals of the same species of the family.

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3. The only generic difference between the two was in the antennæ of *pallida* where the funicle was recorded in the notes as being 1-jointed. Now, in the first place, the antenna was taken from a dried specimen; secondly, I have observed what was the same thing in a few dried specimens of *acuminata;* thirdly, another comparison of the two antennæ made for me by Mr. J. C. Crawford (comparing a single homotypical female *acuminata* in balsam with the type balsam-mounted antenna—Hym. slide 110, U. S. N. M.—of *pallida*) showed in his opinion that they were similar.
4. And certainly I shall include my own personal impressions.
5. The type localities of both species are practically identical.

For these reasons, I consider the species *pallida* identical with *acuminata.*

Besides the original specimens of *acuminata* mentioned above, in the National Museum collection were found six specimens all bearing the label "134", two of them also "3756°. Iss. Sep. 10, '85." These were all remounted in balsam (1 slide, 6 ♀'s, the cotypes). A seventh specimen proved to be a female of *Westwoodella sanguinea* Girault and has been recorded under that species.

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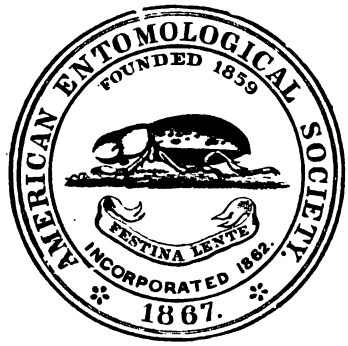

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A REVISON OF THE GENUS PROSOPIS IN NORTH AMERICA.

BY CHAS. W. METZ,
Pomona College, Claremont, California.

(Plates II–IX.)

The genus *Prosopis* is represented in North America by a group of small, very nearly related bees, showing thruout a remarkable homogeneity in form and structure, but at the same time an almost infinite variability in many sculptural and color characters. The genus is widely distributed over the entire United States and far into Canada, being perhaps best represented in the high mountainous States of the Middle West. Representatives may be found in almost any locality that is not entirely devoid of vegetation, but the individuals are seldom abundant. Apparently each species appears thruout its range during a given restricted season, corresponding to the time of blossoming of certain flowers, but too scant investigations have been made so far, to give any definite data. Ordinarily specimens can be found during the summer months from June to September, in most States.

The present paper is based very largely upon a collection of about six thousand specimens accumulated for this purpose. This collection contains series from practically all the localities in which collecting in this genus has been done. The accompanying map shows the approximate range covered by the material. So far as I know it contains a very large proportion, probably three-fourths, of the specimens available in American collections. Most of it is from the collection of Professor C. F. Baker, of Pomona College; for the remainder I am indebted to Messrs. Cockerell, Swenk, Nason, Lovell, and Viereck, who have either loaned or exchanged specimens from their collections, and hearty thanks are due these gentlemen, since without their aid this paper would have been impossible. The C. F. Baker collection contains most of the Baker material from the U. S. National Museum, as well as many cotypes of species originally described from

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this and other collections. On the whole this is the largest amount of material in this genus ever collected for study in America.

An examination of these large series of specimens soon made it evident that very little could be accomplished by the methods of the early students. Up to this time all the descriptions of American *Prosopis* had been based entirely on external characters, usually color or sculpture, and without any figures whatever, except in one or two species. Further than this many of the species had been described from only one or two specimens, distinguished by some minor difference in markings or puncturation. As a result the entire genus was thrown into confusion, and any work done recently made doubly difficult by the difficulty of recognizing the early "species". In fact many of these can only be identified by an examination of the types, and in some cases where the types are lost, even this is impossible. Little weight, therefore, could be given to published descriptions as a whole, and much of the work of preparation has been done in accumulating a series of reliably named specimens for reference. This has been quite successful, considering the fact that very few named specimens of some species are in existence, and a few are found only in European collections. Except for a few of the oldest, which are in Europe, and a few of the later ones which are known only by their unique types, I have examined specimens of a very large part of the described species. For this privilege I am especially indebted to Messrs. Swenk and Cockerell, who have given me access to the entire collections of the Universities of Nebraska and Colorado respectively, which contain a number of the types. From this material I have been able to bring together a study collection including almost all of the known species. Others not actually examined and not easily recognizable have been treated separately as "Uncertain Species."

At no previous time in the history of American Hymenopterology has anyone made any serious attempt to treat the American species of *Prosopis* as a whole. Previous work con-

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sists entirely of scattered descriptions here and there, with once in a long while a paper dealing with the species of *Prosopis* in a certain locality, or with some small circumscribed group of species. The chief factor, outside of lack of material, to prevent more complete studies of late, has probably been the great confusion which exists in the descriptions. Because of the published work being so scattered and so often unintelligible, very few if any writers have known just what species had been previously described, and as a result several have been repeatedly redescribed. In other cases where only a few specimens were obtained, distinctions have been based upon merely minor characters, which prove absolutely worthless in a large series. All of these conditions taken together make the work of revising the genus unusually difficult and unsatisfactory.

The author has endeavored in the present paper to treat all of the North American species, exclusive of Mexican. A systematic treatment of the males has been quite possible, but among the females confusion still exists, and will continue to exist in many cases until some other distinctive characters are discovered. This is especially true of a few species which are widely distributed and exceedingly variable. An illustration will be valuable here not only to show the variation which one may expect to find, but also to show the futility of describing, as many writers have done, and are doing, new species based upon minor differences in size, sculpture, or color, and often using for this purpose only one or two specimens. The little species *P. cressoni* Ckll. is distributed over the whole of North America so far as known, from sea-level to the highest mountains, and thruout its range shows a wonderful series of variations and forms. Some of the variations in the yellow face markings are shown in figures 77–83, and 124–129. In thoracic markings a like variation occurs, extreme southwestern forms having a large amount of yellow on collar, tubercles, and legs, as well as face, while other forms are sometimes entirely dark in the females, except perhaps for a spot on the base of the hind tibiæ. In size they vary from the smallest, which are little

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thicker than a good sized pin, to the largest which are of several times their bulk. Likewise in puncturation a wide range of variation is found, which will be discussed later under the species. In this series four or five forms could be selected which would undoubtedly stand as distinct species in the absence of the rest, but in the complete series their identity is utterly lost among the intermediate forms. Out of this group several species have been described and have stood as such for years, but they are unquestionably only forms or varieties. In two or three other species of wide range this same condition exists, causing great confusion. As might be expected the most variable species are those occurring in the greatest numbers, and over the greatest territory *P. cressoni* and *P. modestus* being striking examples. These two species include a relatively large part, (about one-fouth) of the collections as a rule; and the fact that they show such variability makes it more probable that other species will show a similar tendency when collected in large numbers, and when their entire range is worked over.

At present very little can be said about the distribution and ecology of the genus. So little material has been obtained, and this from such small and widely separated localities, that only an infinitesimal part of what will be necessary for adequate treatment, has been collected. The shaded areas on the accompanying map are intended to show approximately the ground covered up to the present time, and to emphasize the fact that we know comparatively nothing of the genus. The shaded areas cover many times the regions actually worked, which would be better represented by mere dots. Before any really comprehensive work can be done, then, large collections must be built up, including series from intermediate localities. The importance of collecting in large series cannot be too much emphasized, for it is only in this way that any reliable and usable knowledge of our bees can be obtained. At present only two of our species of *Prosopis* are known reasonably well, and these are *P. cressoni* and *P. modestus*. Of the former I have about one thousand specimens, and of the latter about two hundred and

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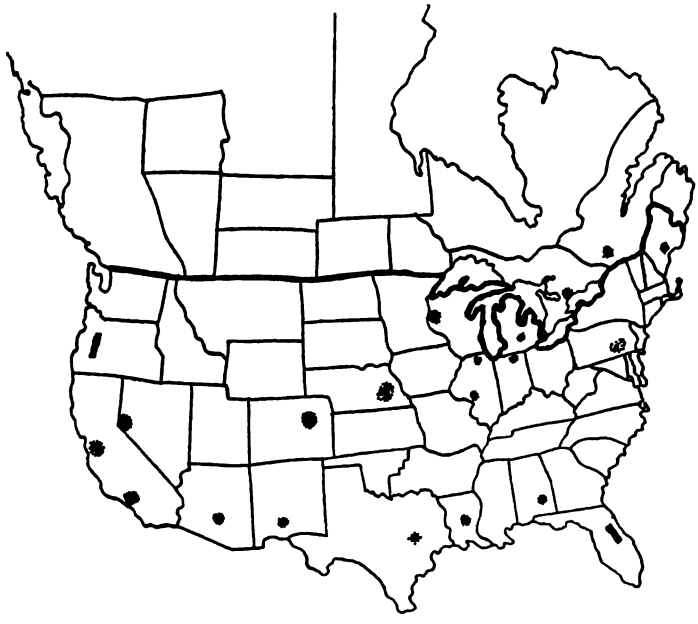
fifty, representing in both cases many widely separated localities, and including many large series. Only with such series as this can a fair idea of any species be obtained.



With the preceding facts in mind we can more readily understand why the older descriptions of *Prosopis* species are so unreliable and confusing. The work of the oldest writers, Smith, Kirby, and others, is practically useless, except as supplemented by later descriptions. Following the natural tendency they characterized their species by the general form and amount of the yellow markings and the general size of the insect, these being the most conspicuous features. The characters which they were accustomed to use in other genera were lacking in this, and they consequently took the most conspicuous they could find. The bees being practically naked no use could be made of pubescence, and being so homogeneous in the structure of the legs no distinctions could be based on these. Consequently they overemphasized the color characters and size. The latter is such a variable

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character as to be almost worthless except when supplemented by other characters; and the former when used in such a general way as "face below antennæ yellow," is also worthless, since it may fit any one of several species. Most of the earlier papers, then, must be ignored unless supplemented by later ones.

Subsequent writers, realizing the inadequacy of the early papers, went considerably more into detail; but they too in many cases based their distinctions on utterly inconstant differences. One of the most confusing of these is the color and venation of the wings, which has been emphasized strongly by some. The actual shade of the wing, whether darkened or not, is of no value whatever, as almost any large series of specimens will show; and the minor differences in wing venation such as, "second submarginal cell little narrowed toward marginal" or "first recurrent nervure entering second submarginal cell", show as much variation in a species as between species, and should not be used. Another character causing confusion is the presence or absence of a spot on the tegula. This is probably the most variable of the color markings, and yet it has been repeatedly used as a diagnostic character. Along with these a number of color characters have given trouble. Certain of them, such as the yellow on the collar or the shape of the face marks, are valuable characters, *if shown to be fairly constant*, and furnish very easy means of distinguishing species which are also differentiated by other characters. In some species, however, and when not supported by a large series, they cannot be depended upon. This fact, as already mentioned, was formerly overlooked, and in consequence we have numbers of specimens described as new because of some such difference. In the species *modestus* alone, no less than eight or ten, and perhaps more, forms have been described as new species for this reason.

Up to 1911 fifty-eight species of *Prosopis* had been described from the United States and Canada. The number is not large in comparison with that of other allied genera, but in the final analysis probably not more than one-third or one-

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half of these will stand. In the present work it has been possible to recognize about twenty species as certainly distinct, and ten or twelve more, as yet but little known, which may be distinct. A number of the species, however, were originally described from females that have since been associated with the males, so about half of the species originally described from males are probably valid.

The association of the sexes in *Prosopis* is extremely difficult, indeed practically impossible in some cases, unless the specimens are actually taken in copula or reared. In the males as a rule an entirely different set of characters is used for identification than is used in the females, and occasionally the two sexes are so entirely different in general appearance that they cannot be certainly associated with our present knowledge. The proportions of the parts of the face, altho of great value in determining species in each sex, are of little use in associating the sexes. In face markings the sexes never agree, altho they often show the same tendency; and in thoracic markings they may or may not agree, altho here also the same tendency toward a large or small amount of color is observed. In sculptural characters a greater constancy is found, and often the sexes can be determined with a considerable degree of accuracy in this way. In actual practice all these characters must be taken into consideration in associating the sexes, and also the locality records must be considered. Many of the species can be associated with a fair degree of accuracy in the latter way if a large series is obtained.

Not only is it often very hard to associate the females with the males, but in some cases it is very hard to separate the females of nearly related species among the wide range of varieties. In this sex the entire group is extremely uniform, and is lacking in those characters which distinguish the males. The face marks are less pronounced and less constant than in the males, and the swollen scape of some of the latter is not found at all in these. Consequently in species having closely allied males, the females are usually so near alike or intergrade so much that accurate separation

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is impossible. This is especially true of the group of species most nearly related to *P. cressoni* and *modestus*.

Fortunately there is a group of characters in the males which usually makes separation in that sex a simple matter. These are the characters of the genitalia; the genital armature and the retracted seventh and eighth ventral plates. These organs are very charateristic and easily recognized, and as a rule are extremely constant. In the present work over two hundred dissections of these have been made, and in nearly all cases it was evident at a glance to which species they belonged. In only one species are they really variable, and then but slightly. This is the species *modestus* which is extremely inconstant in all characters.

By means of the genitalia the genus is naturally divided into three very distinct groups or divisions, which include all the species except the peculiar *basalis*. These I have called the "Modestus Division", the "Cressoni Division" and the "Asininus Division", after three characteristic species in them. The males can also be separated into these three groups by the character of their face marks, as will be seen later. The more similar the species are in external characters the more similar are their genitalia, or vice versa, and the relationship seems to be especially close between the face markings and the genitalia, without much regard to sculpture or size. There are, however, some exceptions like *P. coloradensis*, in which the face marks are very different from, and the genitalia almost identical with some other species.

The genus *Prosopis* is apparently rapidly evolving and the path of the developments can often be quite plainly followed. The species *modestus*, again, is peculiar in this respect. It seems to be in the process of breaking up into distinct groups, and this apparently affects all its characters. The series of figures of the seventh ventral plate (69–72), and the face marks (93–100) of the species will illustrate this point. In a few instances, on the other hand, the evolution has not affected the genitalia, but has exhibited itself in other characters. *P. episcopalis*, for example, is practically identical

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with *P. modestus* in genitalia, and yet is quite different in sculpture. A more striking example is that of *P. fossata* n. sp. which is exceedingly different in sculpture, and even in the proportions of the thorax, from *P. modestus*, and yet has similar genitalia. It is noteworthy, also, that in each of these cases the face marks are very similar.

With such characters in the males, then, there is little chance for confusion in that sex, and very little excuse for describing a new species that is not easily recognizable by either external or genital characters. It should be a rule in this genus that to warrant specific separation an insect should have distinct and characteristic genitalia, or very strongly marked and thoroly diagnostic external characters, or else characters that are shown by a large series of specimens to be reasonably constant, otherwise confusion will almost certainly result. It should also be made a rule to never describe a new species from a female specimen. The types should invariably be males, and the females afterwards associated with them, if anything like satisfactory work is to be done; for the descriptions of females are almost always such that no student could recognize them with certainty. In the material accumulated by the writer are a number of undetermined females which could be described as new, but to do so would simply add to the difficulties in the genus, so they will remain among the indeterminates until the males are found. Likewise in the list of uncertain described species at the end, will be found a number of females, most of which might be referred to almost any of the known species from the descriptions. As long as there are so many species having females in which there are no really plain, easily recognizable characters, it is pure folly to describe a specimen as new which could in any way be confused with others, and those females which cannot be so confused are very rare. These difficulties will become more apparent when the descriptions of the females included in the present paper are examined. That they are unsatisfactory is certain, but so long as there is such great variation in the few diagnostic characters that are available the trouble will remain. At present it has seemed best to describe a typical female in

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each case, and then refer to the existing variations in the discussion. By this means the typical forms can usually be separated, from a study of which the rest may more easily be grouped.

The following is a list of characters that have at some time been used, and a brief statement of their values in classification:

Size.—Quite variable in both sexes, and only of use in connection with other characters.

Wings.—Venation, shade, and yellow spot at base all variable and useless.

Legs.—Size and shape uniform and furnishing no characters; markings of comparatively little value.

Antennæ.—Color useless, except when on scape, and then of only secondary importance; size and form of the scape useful in the males.

Thorax.—Markings on collar and tubercles of value *when constant;* but often not constant; other marks useless; puncturation valuable within moderate limits, but not absolutely constant in any species; enclosure of propodeum likewise variable, and not certain.

Abdomen.—Shape and puncturation valuable in both sexes if distinct, otherwise not.

Head.—Puncturation quite useful, especially that of occiput; proportions, position of antennal sockets, etc., valuable in both sexes, except in a few cases; markings valuable in the male when constant; less so in the female; shade of markings valueless.

Genitalia.—Very valuable in the male, especially seventh and eighth ventral plates.

A word about the collecting and handling of specimens might well be added at this point. First of all it is essential that *large series* be collected, if valuable work is to be done. Next in importance is full and accurate data, for it is only by such means that the range, habitat, and time of appearance can be learned, or a record of the flowers visited by each species obtained. It will also add to the value and facilitate the study of the specimens if they are glued on cardboard points, instead of being pinned thru the thorax, for the pin distorts the specimen and interferes with the lens in examining it. Especial pains should be taken to get specimens in copula, and preserve them on the *same pin*, for

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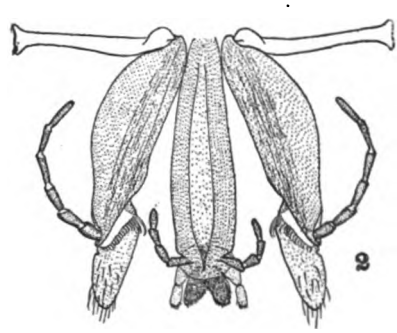
in this way only can the sexes be associated with certainty. In cyanide cans the yellow markings may turn to orange, but no harm is done, for the shade of color is usually of no value anyway.

The breeding and rearing of specimens offers a very attractive field in this genus, and may solve some of the most intricate problems. In this way it can be determined whether some of the species are really distinct, or whether the females that are so similar are of one species and have polymorphic males. At present there is no way of ascertaining this, but from the indications it is not at all improbable that such a condition exists. If so it will greatly simplify matters to have accurate knowledge of just where, and to what extent this is true. Nests of Prosopis containing larvæ or pupæ can often be found in the hollow dead stalks of many common pithy weeds or canes, and it is to be hoped that collectors will take pains to obtain such material whenever possible.

Genus **PROSOPIS**, Fabricius.

Generic characters.—Tongue short, broad, obtuse, emarginate at apex. Marginal cell at apex acuminate or narrowly rounded, never truncate. Body bare or nearly so. First cubital cell much longer than second. Maxillary palpi six jointed; labial palpi four jointed. Usually small black bees with yellow markings.

In America bees of this genus are easily recognized by their black color, small size, absence of pubescence, and presence of yellow markings, together with the short tongue and two cubital cells. The mouth parts apparently show no variation whatever, that could be used in specific diagnosis. A series of twenty or thirty mounts from different species are identical in form and agree essentially with the figure given, (fig. 2).



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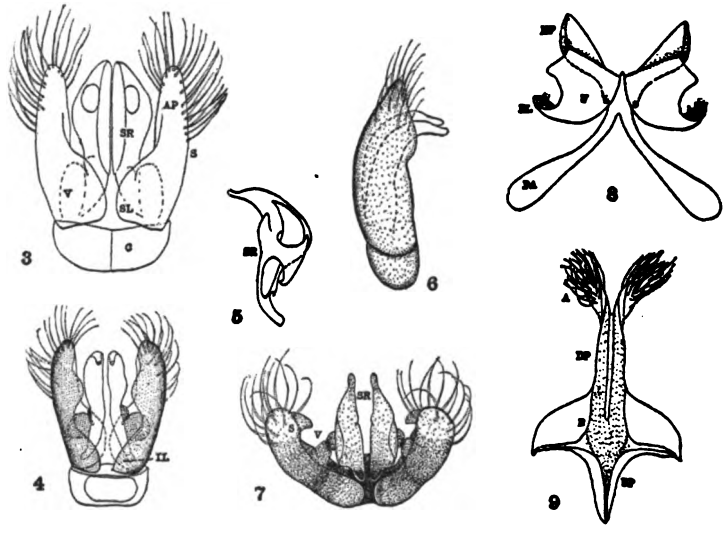
Genital characters.—The male genitalia consist of three separate organs—the genital armature, and the modified seventh and eighth ventral plates. The former is a very complicated structure and hence of less value than the others in classification. Following the nomenclature proposed by Rev. Morice and adopted by several writers in this country, the parts of the armature are as follows: A large, hollow, transparent base (C, fig. 3) the *cardo*, from which project



two tubular *stipites* (S), and two long chitinous rods the *sagittæ* or *sagittal rods* (SR), with a couple of large, dark, rounded structures at their base called *volsellæ* (V). The character of these parts can best be understood by an examination of the figures (3–7). Each outer, tubular rod or *stipes* consists of a long, half open cylindrical sheath, at base attached to the cardo, and at the apex more or less closed; near its base it usually broadens out into two lobes or stationary flaps, which I have designated the *superior* and *inferior lobes* (SL and IL); beyond the lobes is the *apical portion* (AP), which is usually narrower and covered with hairs on its inferior surface. The inner rods or *sagittæ*, are peculiar, long structures, composed of a number of chitinous strips or

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plates, connected by membranes. They are somewhat bow-shaped and flattened, with the narrow side up. Owing to their delicate structure and the ease with which they are distorted, they cannot be depended upon for specific characters. A side view of one of the *sagittæ* is shown in figure 5. The *volsellæ* (V) are stout, vice-like structures, each with two jaw-like lobes; they seldom vary noticeably in the genus, so are of little importance in classification. The *seventh ventral plate* (fig. 8) consists of two arm-like projections, the *proxi-*

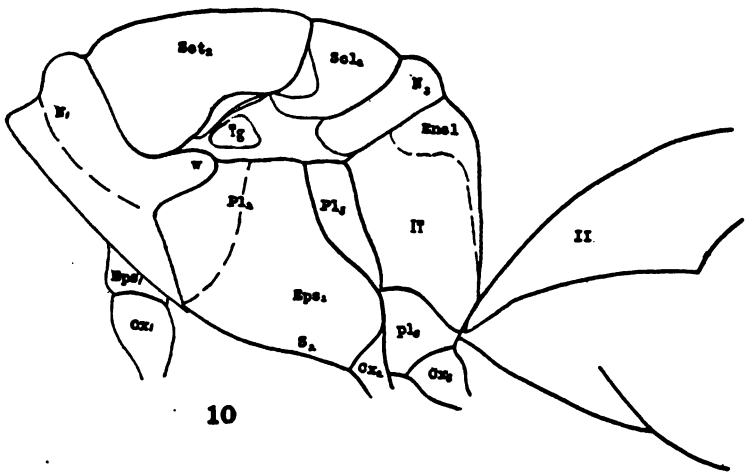

FIG. 10.—*Thorax of Prosopis.* N_1. Pronotum; w, Posterior lobe of Pronotum showing location of tubercle; Sct_2, Mesoscutum; Tg. Tegula; Pl_2, Mesopleurum; Eps_2, Mesoepisternum; S_2, Mesosternum; Scl_2, Mesoscutellum; N_3, Metanotum; Pl_3, Metapleurum; pl_3. subdivision of Metapleurum; IT, Propodeum; Encl, Enclosure of Propodeum; II, Second abdominal tergum; Cx, Coxa.

mal arms (PA) for attachment, uniting at their apices, where are fastened the two broad, thin *wings* (W). The wings differ greatly between species, and furnish some of the most valuable diagnostic characters. Each is composed of the wing proper, to which may be attached a *membranous flap* (MF); and which may be modified at base into some sort of a lobe (BL). The *eighth ventral plate* (fig. 9) is usually quite simple, being composed of a body (B) with four projections. The lateral projections are for attachment to the seventh ventral plate, and do not vary appreciably. The

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basal projection, or *basal pedicel* (BP), altho free, is also very similar in all species. The apical projection, or *distal pedicel*, however, shows a wide range of modifications. When well developed it is rather long and slender, terminating in two *apical lobes* (A), which furnish excellent characters. More detailed descriptions of the various types of ventral plates will appear under their individual headings.

Thoracic nomenclature.—The nomenclature adopted in the present paper is that proposed by Snodgrass in, "*The Thorax of Hymenoptera*," (Proceedings of the U. S. National Museum, XXXIX: 37–91, 1910). The most important changes from the old nomenclature are in the thoracic segments, as shown in figure 10. The area formerly designated "postscutellum" is now called the "metanotum", and that designated "metathorax" has been changed to "propodeum". It is important to note these changes in comparing the accompanying descriptions with former ones, especially the change in the term "metathorax" to indicate an entirely different segment. Other changes will be evident from the figure.

To facilitate discussion of the face markings, and the parts of the face I have applied the term "lateral area" of the face, to that portion between the orbit, the clypeus and supraclypeal space, and below the base of the antennal socket, on each side. This does not include any space above the antennal socket, whether covered by the face marks or not.

KEY TO MALES.—Based on external characters.

Very large, scape enormously swollen, "heart shaped", covering face above antennal sockets (fig. 92).....**basalis.**

Lateral face marks conspicuously divergent from orbital margin above and curving around antennal sockets.....1.

Lateral face marks confluent with or not noticeably divergent from orbital margin.....4.

1. Lateral face marks clavate above or stout, not tapering to tip.....2.
   Lateral face marks short above, upper extensions not clavate, but tapering to a point at apex.....3.
2. Large, upper extensions of lateral face marks greatly enlarged at apex, (fig. 91), antennal sockets very close together, scape and collar with yellow, scape dilated.....**conspicua,** n. sp.

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Smaller, upper extension of lateral face marks narrowed at base, and remote from orbital margin, (fig. 89).....**rudbeckiæ.**

Very small, scape not dilated, upper extension lateral face marks rather stout, not greatly constricted at base, not enlarged greatly at apex (fig. 78), collar dark.....**cressoni.**

Similar to *cressoni* but upper extensions of lateral face marks swollen at apices, (fig. 77) ...**cressoni** var. **magniclavis.**

Similar to *cressoni* but face marks irregular and broken, (fig. 83), not extending above antennal sockets.
cressoni, form **saniculæ.**

3. Large, abdomen coarsely punctured, (fig. 86) .....**tridentulus.**

Small, abdomen impunctate or nearly so, (fig. 87).
grossicornis (type).

4. Supra-clypeal mark absent.....5.

Supra-clypeal mark present..... .....6.

5. Lateral face marks long, tapering above to tip, (fig. 114).
polifolii.

Lateral face marks short, not tapering gradually to tip well above antennal sockets, (fig. 115) .....**nevadensis.**

6. Rather large, upper extension of lateral face marks truncate at upper level of antennal sockets, with horizontal projection mesad above sockets, (fig. 85) .....**varifrons.**

Lateral face marks not extending above antennal sockets, face exceedingly broad, (fig. 106)..... .....**potens,** n. sp.

Lateral face marks broadening above antennal sockets, then tapering to a more or less narrow apex on eye margin, abdomen punctured, but not coarsely.....7.

Lateral face marks extending well above antennal sockets, broadened and truncate or rounded at apex, scape concave exteriorly, not dilated.....**ziziæ.**

Lateral face marks not noticeably enlarged above antennal sockets. either short or narrow .....8.

7. Large, upper extension of lateral face marks long and very stout, face broad, (fig. 108).....**megalotis.**

Similar but face long, and narrow, lateral face marks with upper extensions not so stout, more narrowed at tip, (fig. 109).
asininus.

Very small, face broadened above, not narrow, (fig. 111).
cookii, n. sp.

8. Abdomen coarsely, heavily punctured.....9.

Abdomen impunctate, or with moderate sized punctures .....10.

9. Upper extension of lateral face marks extending about one-half the length of scape above sockets, (figs. 103 and 104).
episcopalis.

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10. Face marks similar to *episcopalis*, entire body coarsely punctured, deep fossa on posterior face of propodeum...**fossata,** n. sp.
Small, lateral face marks short and very broad, supra-clypeal area very narrow, (fig. 107), abdomen punctured..**coloradensis.**
Similar to *coloradensis*, but lateral face marks not extending above antennal sockets, supra-clypeal area not so narrow, (fig. 110). **calvus,** n. sp.
Lateral face marks narrow, tapering to a point not far above sockets, supra-clypeal area not extremely narrow, abdomen punctured, Western N. A.....**wootoni.**
Face marks usually extending above antennal sockets, but not enlarged above, abdomen impunctate or nearly so, scape stout without yellow, (figs. 93–100).....**modestus.**

KEY TO MALES.—Based on genital characters.

Eighth ventral plate without any distal pedicel..**basalis** and **potens.**
Eighth ventral plate with short, truncate distal pedicel, without apical lobes, hairless .....1.
Eighth ventral plate with distal pedicel bearing apical lobes .....2.
1. Wing of seventh ventral plate broad, somewhat ovate, rather heavily haired, without basal tuft, (fig. 29) .....**ziziæ.**
Wing of seventh ventral plate narrowed toward apex, with more or less prominent lobe at base, (figs. 69–76). **modestus, episcopalis, fossata** n. sp.
2. Seventh ventral plate without tooth-like processes or flap, (fig. 60). **cookii** n. sp.
Seventh ventral plate with tooth-like processes and membranous flap.. .....3.
Seventh ventral plate without tooth-like processes. with hairless membranous flap.....6,
3. Apical pedicel of eighth ventral plate with dark, chitinous, more or less horn-like projections, (fig. 49).....4.
Apical pedicel lacking these projections .....5.
4. Basal part of seventh ventral plate long and narrow, (fig. 44). **conspicua.**
Basal part not so narrowed, (fig. 37) .....**rudbeckiæ.**
5. Lobes of eighth ventral plate granulated, stout; teeth of seventh ventral plate short, (figs. 52 and 38).....**cressoni.**
Eighth ventral plate not granulated; seventh ventral plate with short wings, teeth long and narrow; eighth ventral plate long, (figs. 46 and 43) .....**tridentulus.**
Similar to *tridentulus*, but small, eighth ventral plate short (Figs. 48 and 42) .....**grossicornis.**
Apical lobes of eighth ventral plate broad, flat, with short spines; base of wings of seventh ventral plate very long, (figs. 45 and 41).....**varifrons.**

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6. Both ventral plates nude, (figs. 63 and 59).....**calvus,** n. sp.
Seventh ventral plate lacking basal lobe of wings; eighth ventral plate short, stout, (figs 61, 62).....**nevadensis.**
Seventh ventral plate with small, ear-like membranous flaps, not apical, (figs. 55 and 67) .....**asininus.**
Membranous flap apical, broad, basal lobe long narrow (fig. 57). **polifolii.**
Similar to *polifolii*, but basal lobe short. **megalotis, wootoni** and **coloradensis.**

KEY TO FEMALES.

No satisfactory characters for distinguishing all the females have yet been found. The following is intended to aid in separating them into groups, which are treated separately under their individual headings.

Very large, enirely black.....**basalis.**
Very small, face entirely dark.....**cressoni** group.
Abdomen impunctate or nearly so, face marks short..... .....1.
Abdomen impunctate or nearly so, face marks long, extending above antennal sockets.....2.
Abdomen conspicuously punctured, lateral face marks long.....3.
Abdomen conspicuously punctured, lateral face marks short.....4.
1. Large, 7 mm. Yellow on collar and usually on clypeus, (fig. 135), thorax finely, densely punctured, Wes. U. S....**conspicua.**
Similar but smaller, 4–5 mm., punctures of thorax sparse, tarsi dark, lateral areas of face narrow, (fig. 137).....**rudebeckiæ.**
Similar but very small, tarsi yellow ....**cressoni** form **mesillæ.**
Similar but collar and tarsi dark, very small .....**cressoni** group.
Rather large, 6 mm., collar yellow, puncturation moderate, East United States.....**modestus** group.
Large, stout, face marks very small, collar dark, (fig. 130). **varifrons** and **episcopalis.**
Collar yellow, lateral face marks mere strips, lateral areas broad, Wes. U. S., (fig. 117).....**coloradensis.**
2. Face marks filling lateral areas, long, triangular, (figs. 138 and 139). **ziziæ, episcopalis.**
Collar yellow, puncturation of thorax exceeding coarse.....**fossata.**
3. Collar yellow, lateral face marks continue broad to truncate apex far above antennal sockets.....**asininus, megalotis.**
Lateral face marks narrow, long, abdomen very finely punctured, (figs. 118, 122).....**wootoni, polifolii.**
4. Abdomen very finely punctured, but closely so. **nevadensis** and **cookii.**

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PROSOPIS BASALIS Sm., 1853.

1853. *P. basalis*, male, female. Sm. Cat. Hym. Brit. Mus. 22:23.
1869. *P basalis*, Cr. Proc. Bos. Soc. Nat. Hist. 12:269.
1882. *P. basalis*, Prov. Nat. Can. 13:258.
1883. *P. basalis*, Prov. Faun. Ent. Can. Hym. 1:726.
1890. *P. basalis*, Ckll. Can. Ent. 22:39.
1890. *P. basalis*, Ckll. Bull. Colo. Biol. Assn. 1:31.
1894. *P. basalis*, Harrington. Can. Ent. 26:14.
1896. *P. basalis*, Evans. Can. Ent. 28:12.
1896. *P. basalis*, Ckll. Psyche Supp. 7:26.
1901. *P. basalis*, Lov. Ent. News. 12:4, 7.
1901. *P. basalis*, Ckll. Psyche. 9:283.
1903. *P. basalis*, Ckll. Psyche. 10:74.
1904. *P. basalis*, Vier. Can. Ent. 36:93.
1906. *P. basalis*, Ckll. Bull. Am. Mus. Nat. Hist. 22:423.
1910. *P. basalis*, Lov. Psyche. 17;185.

Male.—Easily known by its large size, enormous "heart shaped" scape, peculiar marks, heavy punctures, etc.

Length about 9 mm. Head broad, large; scape enormously swollen, flattened, almost circular in outline, covering face above antennal sockets; clypeus short, broad as long, very narrow at base; lateral areas very broad; supraclypeal area extremely narrow and long; antennal sockets placed very close together, (fig. 92). Thorax and abdomen stout, the former comparatively heavily haired, with rather long white pubescence, the latter with apical bands on first two segments. Propodeum short, slanting, superior face not longer than metanotum; posterior face large, margins not rounded.

Sculpture.—Front, vertex, occiput, pronotum, mesonotum, and pleura densely, but not coarsely punctured; metanotum rugulose; enclosure of propodeum small, narrow, bowl very short and narrow, neck long; surface of bowl rugose, not pitted; remainder of propodeum rugulose. Abdomen; dorsum heavily punctured, first segment more sparely than remainder; venter slightly punctured.

Yellow Markings.—Lateral face marks very broad, filling lateral areas, and narrowing to eye margin above; supraclypeal mark filling supraclypeal area below antennal sockets, and extending above in a very narrow, pointed process. Scape with lateral half orange or yellow (fig. 92). Thorax entirely dark. Legs with anterior tibiæ in front, middle and hind tibiæ at base, and middle and hind basitarsi yellow.

Genitalia.—Armature entirely different from that of any other species. Stipes long, broadening apically, ending abruptly, not in a rounded apex as usual, but flat, with a membrane connecting the edges like a drum head, fringed with long hairs; superior lobe very small, corresponding to a similar inferior lobe; sagittal rods poorly developed, largely membranous, short; volsella, moderate in size, (fig.

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32). Seventh ventral plate also unique; lateral wings not separate attachments, but enlargements of the proximal arms; apical portion of the lateral margin with long spine-like hairs; basal portion with tuft of fine hairs, (fig. 36). Eighth ventral plate merely a triangular body, without apical pedicel, (fig. 34).

Female.—Easily known by its large size and entire lack of yellow markings. As large, or larger than male which it resembles in general characters, but scape normal.

Sculpture.—Puncturation much more light than in male. Enclosure of propodeum smooth, lateral faces slightly punctured instead of rugulose. Abdomen practically impunctate.

Yellow Markings.—Entirely lacking.

Habitat.—Apparently not restricted in the United States. This species has been reported from nearly every portion of the country where much collecting has been done, but it is not common in any locality.

This, the largest species of *Prosopis* in North America, is so entirely different from any other known species in this country that there is no chance for confusing it, in either sex. Just the range of variation in the species is not known. Eight specimens before me from Colorado, New Mexico, and South Dakota show practically none, but in puncturation they all differ considerably from the original descriptions, which state, "basal segment of abdomen very smooth and shining" for both sexes. As Smith's work was probably done largely with a hand lens this apparent difference may not be true.

PROSOPIS POTENS n. sp.

Male.—Distinguished by its short, broad head, stout clypeus, both of which resemble *P. basalis* in form, by its short, heavy lateral face marks, and by its very distinct genitalia.

Length about 6–7 mm.; stout, head very broad; clypeus broad as long, somewhat narrower at base than lateral areas at same level; lateral areas unusually broad; supraclypeal area broader than long below base of antennal sockets. Scape stout, concave posteriorly. Thorax stout; metanotum comparatively long, two-thirds length of scutellum; propodeum short, with no distinct superior face, slanting off directly from base.

Sculpture.—Puncturation of entire body remarkably light. Front, and part of vertex with small, shallow, close punctures, not extending onto occiput or cheeks; pronotum not prominent, indistinctly punctured; mesoscutum sparsely punctured with small, round punctures,

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separated by two or three times the diameter of one puncture; scutellum similarly, but more sparsely punctured; metanotum finely roughened. Bowl of enclosure of propodeum long and narrow, not widened abruptly at base of neck, surface smooth, not pitted, margin indistinct; neck of enclosure medium sized, not broad; lateral areas of posterior face smooth, not punctured, microscopically wrinkled; sides similar. Mesopleura extremely sparsely punctured, with small round punctures as on mesoscutum, separated by three to five times the diameter of one puncture; metapleura almost smooth, not depressed. Abdomen impunctate, not glossy.

Yellow Markings.—Lateral face marks very broad and short, filling lateral areas, ending abruptly on level with upper level or antennal sockets; supraclypeal mark broad, not extending up between antennal sockets, (fig. 106); stripe on front of scape yellow. Thorax dark, except for a small spot on tubercles; legs with front of fore tibiæ, base of hind tibiæ, and all basitarsi yellow.

Genitalia.—Very distinct; armature stout; cardo very short and small, superior lobe of stipes inconspicuous, apical part swollen, pointing mesad at tip, and with long coarse hairs; sagittæ and volsella not peculiar, (fig. 35). Seventh ventral plate of the same general type as that of modestus, but apical portion of wings not attenuated, and basal lobe long, extending out at an angle of about forty-five degrees, and bearing an apical tuft of fine hairs; lateral and apical marging with a fringe of heavy hairs, (fig. 31). Eighth ventral plate similar to that of *P. basalis*, but smaller, (fig. 33).

Female.—Unknown.

Habitat.—Unique type from Montreal, Queb., June 10, 1906. In collection of C. F. Baker, Pomona College.

This species resembles members of the "Modestus Division" in size, and form, but is very different from any of these. Its broad face, and rudimentary eighth ventral plate resemble those of *P. basalis*, from which it is easily told by the scape and puncturation. The genital armature, and both ventral plates are easily distinguished from any of the other species. Probably the face marks will be found somewhat variable in a series, for they are not clear cut, as the figure shows. Likewise the puncturation may not be uniformly faint and sparse, but the form of the propodeum will probably be constant. Possibly this is one of the species which has been described before, but is indistinguishable from the modestus group in the description; or it may be included in the list of uncertain forms at the end. In any case it is unrecognizable from the previous description.

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CRESSONI DIVISION.

This division is characterized in the males by the presence of a number of tooth-like projections, forming a sort of comb on the outer margin of each wing of the seventh ventral plate; and also by the upper extensions of the lateral face marks, which diverge from the orbital margin, or project mesad above antennal sockets. Within the division are three smaller groups. The first includes *P. cressoni*, *P. rudbeckiæ*, etc., distinguished by having short, stout, teeth on the seventh ventral plates, and stout, or clavate upper extensions of the lateral face marks. The second group has short winged seventh ventral plates with long, narrow teeth, and has short, tapering upper extensions of the lateral face marks: this includes *P. tridentulus*, and *P. grossicornis*. The third includes only one species, *P. varifrons*, having long, narrow wings of the seventh ventral plate, and quite different eighth ventral plate and face marks from the others. The division is not restricted geographically, representatives being found in all parts of the country, but it is best represented in the Rocky Mountain States.

PROSOPIS CRESSONI Ckll. 1907.

1869. *P. pygmæa*, Cr. Proc. Bos. Soc. Nat. Hist. 12:272.
1895. *P. pygmæa*, Rob. Tr. Amer. Ent. Soc. 22:116.
1896. *P. pygmæa*, Rob. Can. Ent. 28:136.
1898. *P. pygmæa*, Ckll. Ent., 1898, p. 217.
1899. *P. pygmæa*, Ckll. Ent. News. 10:3.
1901. *P. pygmæa*, Lov. Ent. News. 12:5.
1901. *P. pygmæa*, Lov. Ent. News. 12:78.
1904. *P. pygmæa*, Rob. Can. Ent. 36:273.
1906. *P. pygmæa*, Bull. Amer. Mus. Nat. Hist. 22:423.
1907. *P. cressoni*, Ckll. Ann. and Mag. Nat. Hist. Ser. VII. 20:131.
1909. *P. pygmæa*, Lov. Ent. News. 10:3.
1910. *P. pygmæa*, Lov. Psyche. 17:178.

Syn. (*P. pasadenæ*, Ckll.).
1810. *P. pasadenæ*, Ckll. Ann. and Mag. Nat. Hist. Ser. VIII. 5:30.

Syn. (*P. labiatifrons*, Ckll.).
1896. *P. labiatifrons*, Ckll. Psyche. 7:437.
1901. *P. labiatifrons*, Lov. Ent. News. 12:7.

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P. cressoni, form MESILLÆ (Ckll.).

1895. *P. subtilis*, Fox, (female). Tr. Amer. Ent. Soc. 22:295.
1896. *P. mesillæ*, Ckll. (male). Can. Ent. 28:42.
1898. *P mesillæ*, Ckll. Can. Ent. 30:237.
1901. *P. mesillæ*, Lov. Ent. News. 12:9.
1901. *P. mesillæ*, Ckll. Ent. News. 12:39.
1903. *P. mesillæ*, Ckll. Psyche. 10:74.
1904. *P. mesillæ*, Vier. Can. Ent. 36:93.

P. cressoni, form SANICULÆ (Rob.).

1896. *P. saniculæ*, Rob. Can. Ent. 28:137.
1896. *P. saniculæ*, Ckll. Psyche. 7:438.
1901. *P. saniculæ*. Lov. Ent. News. 12:5.
1904. *P. saniculæ*, Rob. Can. Ent. 36:273.
1910. *P. saniculæ*, Lov. Psyche. 17:179.

P. cressoni, var. MAGNICLAVIS (Swk. and Ckll.).

1910. *P. magniclavis*, Swk. and Ckll. Ent. News. 21:68.

Typical Male.—Small, 3–5 mm. Distinguished by small size, dark collar, and clavate, divergent (from orbit) upper extenson of lateral face marks, which are not greatly narrowed at base.

Very small, rather stout; face broad above, rapidly narrowing below; clypeus rather short, base about equal in breadth to lateral face marks at same level; scape short, stout, slightly concave exteriorly.

Sculpture.—Front and vertex closely, confluently punctured, punctures not extending onto occiput or cheeks; mesonotum moderately punctured with small round punctures; scutellum similarly but more sparsely punctured; metanotum rugulose or confluently punctured. Propodeum normal; bowl of enclosure broad, pitted; neck narrow; lateral areas of posterior face almost smooth; sides rugulose. Mesopleura rather closely punctured with larger punctures than those of mesonotum; metapleura striate. Abdomen impunctate, except for a few sparse punctures of first segment.

Yellow Markings.—Supraclypeal mark usually long, extending above antennal sockets; area below antennal sockets quadrate; lateral marks filling lateral areas and extending upward in long, rather stout, somewhat clavate extensions, leaving orbital margin on level with base of antennæ, and projecting mesad, ending in slightly swollen tips above antennal sockets, (figs. 78, 79). Scape with yellow stripe in front; tubercles with large yellow spot; front of fore tibiæ, basal third of middle and hind tibiæ, and basitarsi yellow.

Genitalia.—Armature rather short and stout; cardo short, rounded; stipes stout, superior lobe broad and long, extending about two-thirds of way to apex, where it curves in almost abruptly; apical portion stout, more or less rounded at tip, moderately haired, with a tuft-like

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patch near apex; sagittæ normal (flattened in figure), (fig. 16 is identical in form with this). Seventh ventral plate with rather slender, somewhat triangular wings, having rather short teeth in the comb-like margin, which extends along about two-thirds of the length; membranous flap transparent, extending laterad, covered with fine hairs, (fig. 38). Eighth ventral plate short; base normal; distal pedicel narrow, ending in two rounded apical lobes, connected on one side by a membrane; lobes granular in appearance, possibly caused by short spines, slightly haired at apex, (fig. 52).

Typical Female.—Agrees with male in general characters; antennæ short and clavate, scape narrow. Punctures of thorax usually sparse and often faint. Face marks broad irregular stripes filling most of lateral areas, with often a spot on clypeus. Thoracic markings only on tubercles; legs with yellow only at base of tibiæ.

Form MESILLÆ.

Male—Differs from typical form as follows: Upper extension of lateral face marks very short and stout, not curving around antennæ; yellow stripe on scape broader and more conspicuous, (fig. 80). Tegulæ, tarsi, and a large part of tibiæ yellow. Puncturation of thorax more sparse and faint; pits on propodeum more shallow and inconspicuous; first two abdominal segments distinctly punctured.

Female.—Differs from typical form as follows: Lateral face marks well developed, filling lateral areas, and extending to top of antennal sockets; large part of clypeus and often spot on supraclypeal area yellow; two stripes on collar, tegulæ, wing bases, front of fore tibiæ, large part of other tibiæ, and all tarsi bright yellow. Puncturation of head and thorax exceedingly delicate; enclosure of propodeum smooth, not pitted.

Form SANICULÆ.

Male.—Differs from typical form as follows: Scape broader at apex; yellow on face reduced to two narrow, irregular stripes on lateral areas, an irregular stripe on clypeus, and a small spot on supraclypeal area, (fig. 83). No yellow on thorax or legs, except base of hind tibiæ.

Female.—Has no yellow markings except, "a narrow line on each side of face, (sometimes wanting), and base of tibiæ." (Rob. Can. Ent., 28: 137).

Variety MAGNICLAVIS.

Male—Differs from typical form in that upper extension of lateral face marks project straight from lateral areas, then curve around antennal sockets, and end in a large knob; supraclypeal mark longer also, (fig. 77, taken from paratype).

Female.—Indistinguishable from "form mesillæ".

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Habitat.—Apparently the whole of North America from Mexico well into Canada, at all altitudes. Recorded on flowers of *Cleome*, *Mentzelia*, *Fragaria*, *Tamarix*, *Mentha*, *Solidago*, *Amorpha*, *Melilotus*, *Grindelia*, *Astragalus*, *Drymocallis*, *Bigelovia*, *Wild Plum*, *Salix*, *Sisymbrium*, and *Clematis*.

Specimens examined: 500–600 males, and 400–500 females, from Calif., Colo., Nev., N. M., Ariz., Neb., Wisc., Mich., Ill., Me., Cana., etc.

The variations in this little species are astounding. I have before me over one thousand specimens from widely separated localities all over the United States, and parts of Canada, including very large series from many of these localities, and among them all sorts of modifications are found. The species is, I believe, the most common in America, as it is most often represented in local lists, and forms a considerable part of most collections. Covering such an area as it does, and being subject to such different conditions, it is only natural that many variations should be found. Extremes of these variations, if taken alone, would be considered distinct species at once, and it is only in an enormous series that the intergradations become evident, and distinctive characters vanish. An idea of the variations in color characters in the species can be obtained from figures 77–83 and 124–129, which indicate a few of the steps from the strongly, clearly marked forms to the poorly marked, or wholly dark ones. To be complete the series should include many more of the intermediate forms, but those given will serve to illustrate the range of variation. In nearly all characters of both sexes a similar degree of variation is found. The puncturation varies all the way from that of the typical form as given, or even more dense, to very faint, indistinct punctures in some specimens. In none, however, is the abdomen densely, coarsely punctured, as it is in some other species; at most the first two or three segments are moderately punctured.

The form *mesillæ* is found mostly in New Mexico, Arizona, and the surrounding States, apparently being a southern form. It can only be distinguished by its color markings,

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which are very bright and conspicuous in the extreme specimens, as described, but are not at all constant. Some specimens can be found from practically any locality which lack the marking of one part or another, and the rest which do not vary in this way show every variation from the markings of this, to those of the other forms, so that no definite line of demarcation can be found to distinctly separate it. Specimens from Colorado, and farther north show a gradual, altho irregular change from this form to the others, with longer face marks and more restricted thoracic markings. Some of the northern forms, however, include specimens with yellow on the collars of the females, or other of the markings of the southern form, so that the modification is not determined by locality entirely, but the tendency toward variation is found thruout the entire range.

No particular region seems to favor any one of the other groups in this species, unless it is the variety *magniclavis*, which is only recorded from Nebraska. As only three specimens of this are known in the male sex, however, nothing can be told of its range. I have paratypes of both sexes of this from Mr. Swenk, who originally described it as new. There is nothing to warrant its being kept as distinct, tho, in the light of the preceding facts. The only character to distinguish it is the large upper extension of the lateral face marks in the male, and this is very little different from some of the strongly marked specimens from other localities. In genitalia it is identical with the typical form, and the only ground for separating it as a variety, is that there is not such a complete series connecting it with the typical form, as in the other cases. I have, however, a few specimens that approach it so closely as to make the separation difficult, and undoubtedly when more collecting is done the full series will be obtained. But until this takes place it is well to call it a variety.

The specimen described above as "form *saniculæ*" undoubtedly corresponds to what Robertson took to be a disdistinct species because it had very irregular, and poorly developed face marks. I think, however, that there can be

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no doubt about its being a mere form of *P. cressoni* which is poorly pigmented. In genital, and sculptural characters, as well as size and form, it agrees perfectly with *P. cressoni*, unless a slight modification of the eighth ventral plate is characteristic. In the only specimen at hand this plate has apical lobes that lack the granular appearance of the typical specimens, and are somewhat flattened, (fig. 51), but I think this is very likely due to the individual mount. The face marks of this form are obviously of the same type of those of the typical form, the only difference being that they are incomplete, so in such a variable group as this it would be folly to give it specific rank. This conclusion is made even more certain by the fact that the females are indistinguishable from those of the typical form. I have a complete series of these showing a perfect gradation, or rather showing all the intermediate variations, from this to the more strongly marked forms, and even some in which there is practically no yellow pigmentation whatever. With such series as these to examine there can be no doubt about the specific identity of the various specimens which have been considered distinct.

Aside from the forms given above which can be in some cases distinguished from the typical specimens, are two "species" which can not even be separated as forms. These were described as *P. pasadenæ* Ckll. and *P. labiatifrons* Ckll. Of the former I have specimens determined by Professor Cockerell and a large series from around Pasadena, the type locality, all of which are indistinguishable from the series of typical specimens. As to the identity of the latter I am not so sure, as I have no specimens, but it is indistinguishable by the description, at least. It is described as differing from *P. cressoni* by its larger size, which might indicate *P. rudbeckiæ*, but as Professor Cockerell described this also, I infer not. *P. cressoni* varies so markedly in size that no distinction can be made on this alone, and unless new characters are obtained from the type it will certainly have to remain under *P. cressoni*.

Among the various series of *P. cressoni* I have come upon

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a number of interesting freakish specimens, which indicate still more strikingly the tendency of the group as a whole. Probably the most peculiar of these is the female shown in figure 124, which has almost fully formed face marks of the male type. In other respects, such as genitalia, etc., it corresponds perfectly with the other females, but in this it shows a decided resemblance to the males, having considerably more typical face marks than male specimens of the *saniculæ* form. Such modifications as these two, in which a tendency toward the markings of the opposite sex is shown, can only be attributed to variations, and illustrate again the importance of having series of specimens before describing new species on markings alone.

PROSOPIS RUDBECKIÆ Ckll. and Csd. 1895.

1895. *P. rudbeckiæ*, Ckll. and Csd. Trs. Amer. Ent. Soc. 22:300.
1896. *P. rudbeckiæ*, race *ruidosensis*, Ckll. Psyche Supp. 7:30.
1896. *P. rudbeckiæ*, race *subdigitata*, Ckll. Psyche Supp. 7:31.
1896. *P. rudbeckiæ*, Ckll. Psyche Supp. 7:31.
1901. *P. rudbeckiæ*, Lov. Ent. News. 12:9.

P. rudbeckiæ, form DIGITATUS (Ckll.).

1896. *P. digitatus*, Ckll. Psyche Supp. 7:30.
1901. *P. digitatus*, Lov. Ent. News. 12:8.
1909. *P. digitatus*, Ckll. Ann. and Mag. Nat. Hist. Ser. VIII. 4:27.
1909. *P. digitatus fedorica*, Ckll. Ann. and Mag. Nat. Hist. Ser. VIII. 4:27.

P. rudbeckiæ, var. BAKERI (Ckll.).

1896. *P. bakeri* Ckll. Psyche Supp. 7:26.
1904. *P. bakeri*, Vier. Can. Ent. 36:93.

Typical Male.—Small, averages a trifle larger than *P. cressoni*. Distinguished by long upper processes of lateral face marks, very narrow at base, remote from orbital margin; by yellow on collar (usually); and by horn-like processes of eighth ventral plate.

Very closely related to *P. cressoni*, which it resembles in form and structure.

Sculpture.—Similar to that of *P. cressoni*.

Yellow Markings.—Lateral face marks broad, filling lateral areas, extending above in a straight, narrow line, following the outline of antennal sockets, remote from orbit, ending in a more or swollen tip,

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(fig. 89); scape with irregular stripe in front. Tubercles, anterior tibiæ, and tarsi yellow; two yellow spots on collar, sometimes wanting.

Genitalia.—Armature and seventh ventral plate similar to those of *P. cressoni*, but larger, (figs. 16, 37); eighth ventral plate quite distinct, having the apical pedicel narrow, terminating in two short, membranous lobes, each with a horn-like chitinous rod mesad, (fig. 50).

Female.—Quite similar to same sex of *P. cressoni*, not always distinguishable from that species, but typical forms larger, with considerable yellow on collar and clypeus, (fig. 137).

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Male.—Similar to typical form, but thorax wholly dark, and upper processes of lateral face marks finger-like, without terminal enlargements; scape dark, not dilated.

Female.—Indistinguishable from typical form.

Variety BAKERI.

Male.—Differs from typical form in having scape swollen, strongly concave exteriorly, the entire front and concave portion being yellow; upper processes of lateral face marks long, narrow at base, following outline of antennal sockets, ending in a large, round swollen apex, (fig. 88 shows the style of lateral face marks, although it is from another form).

Female.—Indistinguishable from typical form.

Habitat.—Apparently not restricted in the United States, I have specimens from Colo., Nev., N. M., Ariz., Calif., Ore., Tex., Alab., N. J., Cana., etc., at various altitudes. Judging from the material at hand, and the records of others, it is probably much more common in the Rocky Mountain States than eastward.

Specimens examined: about 150.

This species is a very near relative of *P. cressoni* which it resembles in both sexes. The females of the two, as is usual with such close allies, are indistinguishable, except in the typical forms. The males, altho usually quite distinct, sometimes resembles those of *P. cressoni* in face marks and have to be separated by genital characters. In color, size and sculpture, this species varies much as does the other, and most of the discussion given under that will apply here. Usually both sexes have yellow on the collar, but numerous specimens lack it. The face marks of the males before me

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show much less variation than those of *P. cressoni*, but this is very likely due to the smaller number of specimens. In thoracic and leg markings they vary just as much: many specimens having practically no yellow on collar, tubercles, or tegulæ, which condition is usually accompanied by a reduction to some extent of the face markings, such as the loss of the swollen apices of the lateral face marks. The extreme specimens of this kind I have considered identical with Cockerell's "P. digitatus", and have called "form digitatus" as described above. This was described as a distinct species with a number of varieties, or races, (Ckll. Psyche Supp. 7:30), but undoubtedly they are merely poorly pigmented specimens, corresponding to the form "saniculæ" under *P. cressoni*. The same tendency toward poor pigmentation is found in a number of species, but other characters such as genitalia, sculpture, etc., prove their specific identity with the better colored forms in each case. This is made especially evident from the fact that no two of these specimens agree in the poorly developed marks, some having one part and some another more fully developed. A series illustrating this in the case of *P. cressoni* is shown in figures 81–83. This variability accounts for the various specimens described by Cockerell as races.

Under "variety bakeri" I have included specimens of the type described by Cockerell as *P. bakeri*. A specimen of this in the C. F. Baker collection is very distinctly marked, as described, but other forms show such a tendency toward the markings of this form that specific distinction is unwarranted, especially in such a species as this in which a considerable range of variation in marking is found, and since the genitalia are identical with those of a large series of typical specimens.

The insufficiency of the characters upon which the forms and varieties described as species, *P. bakeri*, *P. digitatus*, *P. ruidosensis*, and *P. rudbeckiæ* race *subdigitatus*, were based, can be seen from the following key given by Cockerell for separating them:

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"A. Tubercles wholly black.
  1. Wings tinged grayish, mesothorax pubescent...**subdigitata.**
  2. Wings tinged brownish, mesothorax bare.....**digitata.**
B. Tubercles partly yellow.
  1. Comparatively large, face white, scape wholly white in front. **bakeri.**
  2. Face pale yellow, scape with at most a yellow mark.
    a. Larger, wings tinged brownish.....**ruidosensis.**
    b. Smaller, wings tinged grayish .....**rudbeckiæ.**"

Such distinctions, altho perhaps appearing quite final in a small series, are of no value whatever *as specific characters*, in the light of the preceding facts. I have the Baker collection containing the lots from which most of these were described, and have examined types or authentic specimens of all but *digitata*, and they cannot be separated except as forms or varieties as given above.

In addition to the preceding variations there is one in which the modification is in the genital characters instead of face marks. This I have called *P. rudbeckiæ* var. *granulatus* from the granulated appearance of the eighth ventral plate which resembles in this respect that of *P. cressoni*, (fig. 54). This plate is intermediate between that of *cressoni* and *rudbeckiæ*, having the granulated appearance of the former, but with dark chitinized portions suggesting the horn-like projection of the latter. In face markings this resembles var. *bakeri*, but lacks the yellow on the scape, (fig. 88). I have three male specimens of this variety, all agreeing with this description.

PROSOPIS CONSPICUA n. sp.

Male.—Distinguished by its large size, greatly swollen scape, greatly dilated upper extension of lateral face marks, fine dense puncturation of thorax, yellow on collar, tubercles, and tegulæ; and by the long narrow wings of the seventh ventral plate.

Large, about 6–7 mm. in length; scape stout, greatly dilated and flattened; face rather narrow; antennal sockets close together, (fig. 91); clypeus less than one-half as wide at base as at apex, somewhat narrower at base than lateral face marks at same level. Thorax and abdomen stout; propodeum rather short, without any conspicuous superior face.

Sculpture.—Front and vertex conspicuously punctured with moderate sized, round punctures, becoming confluent near antennal sockets;

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cheeks shallowly, striate-punctate. Mesoscutum very finely, densely punctate, somewhat granular in appearance; scutellum similarly but more sparsely punctured; metanotum finely rugose. Propodeum lightly sculptured; enclosure small; bowl rather stout, surface not pitted, almost smooth; lateral face and sides almost smooth, microscopically wrinkled; posterior face not bordered by a raised ridge, but rounded off. Mesopleura finely, densely punctured, rather rugulose, like mesonotum; metapleura similar. Abdomen impunctate, dull, not shining.

Yellow Markings.—Lateral face marks very large, filling lateral areas, extending above in a broad projection following orbit, diverging from eye at level of base of antennal sockets, ending in a great rounded, swollen apex, nearly as large as the scape, the two coming quite close together above antennal sockets, (fig. 91). Scape with front entirely yellow; collar, except for small space at center, tubercles and spot on tegulæ yellow. Legs with front of fore tibiæ, base and apex of middle and hind tibiæ, and all tarsi yellow.

Genitalia.—Armature of the same type as that of *P. rudbeckiæ* but much larger, (fig. 15). Seventh ventral plate large, similar to that of *P. rudbeckiæ*, but wings long, with long, narrow basal portion as in *P. varifrons;* the tooth-like processes are short and only extend along about half of the margin, (fig. 44). Eighth ventral plate identical with that of *P. rudbeckiæ*, except in size, (fig. 49).

Female.—Very similar to male in size, form, and sculpture. Scape normal; clypeus unusually narrow at base, being narrower than lateral areas at that level; supraclypeal area very short and broad (fig. 135).

Sculpture.—Practically identical with that of male.

Yellow Markings.—Lateral face marks short, broad, filling most of lateral areas, but not extending above antennal sockets; spot on clypeus usually present. Thoracic markings as in the male. Marks on legs limited to the base of tibiæ.

Habitat.—Ormsby county, Nev., and Santa Clara county, Calif. Type locality the former.

Specimens examined: 150.

This species is nearest related to *P. rudbeckiæ*, but differs very markedly in face marks, proportions of face, position of antennal sockets, size of scape, long wings of seventh ventral plate, etc., as shown above. The 150 specimens from Nev. and Calif. show practically no variation, and are all easily distinguished by the characters mentioned. The peculiar, fine, granular puncturation of the thorax is very characteristic, and not found in any other species. The species is much larger than even the extreme forms of *P.*

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rudbeckiæ, and has the most conspicuous yellow markings of all the species. So far it is only known from the localities above mentioned, which are only a short distance apart, so its range would appear to be limited.

PROSOPIS TRIDENTULUS Ckll. 1896.

1896. *P. tridentulus*, Ckll. Psyche Supp. 7:27.
1896. *P. tridens*, Ckll. Psyche Supp. 7:28.
1898. *P. tridentulus*, Ckll. Ent, 1898, p. 217.
1901. *P. tridentulus*, Lov. Ent. News. 12:9.
1903. *P. tridentulus*, Ckll. Psyche. 10:74.
1906. *P. tridentulus*, Ckll. Bull. Amer. Mus. Nat. Hist. 22:423.

Male.—Distinguished by its large size, heavily punctured abdomen, short, curved, upper extensions of lateral face marks, narrow at tip; and its dark collar.

Rather large, about 7 mm. long, slender. Clypeus short, broad at apex, as broad as long, usually narrowed at base. Supraclypeal area below antennal sockets very long; scape large, swollen, not concave laterad. Metanotum comparatively long, over half the length of scutellum; pronotum large and prominent.

Sculpture.—Front, vertex. and occiput, densely, confluently punctured, punctures extending down on to cheeks. Pronotum heavily punctured; mesonotum densely, almost confluently punctured, punctures smaller than on vertex; scutum similarly but more sparsely punctured; metanotum rugoso-punctate, almost pitted. Posterior face of propodeum small, not bordered by a ridge, rounded above; bowl of enclosure iong, broad, base and sides with elongate, subquadrate pits; neck of enclosure narrow; lateral areas of posterior face, and sides shallowly, confluently punctured. Mesopleura shining, densely punctured, punctures about same as on mesoscutum; metapleura striate. Abdomen heavily punctured; first segment shining, punctures wide apart; second segment much more densely punctured, especially at base, punctures about size of those of mesoscutum; apical segments with more shallow, larger, and more coarse punctures; punctures on all segments more heavy laterad, and sparse, large and shallow on venter.

Yellow Makings.—Supraclypeal mark very long, extending well above antennal sockets; lateral face marks short, upper processes small, inner margin following outline of antennal sockets, usually confluent with them; outer margin leaving orbit on level with base of antennal sockets, curving gradually around to narrow apex; labrum and mandibles with yellow spots, (fig. 86). Tubercles and usually spots on tegulæ yellow. Legs with front of fore tibiæ, basal half of middle and hind tibæ, and basitarsi yellow.

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Genitalia.—Armature very large and stout; cardo unusually long and heavy, narrowing to a rounded tip; stipes stout, superior lobe small, not curving in abruptly at distal end, only extending about one-third the length of stipes; apical portion stout, rounded, heavily haired; sagittal rods not peculiar, reaching to end of stipites; volsella normal, (fig. 18). Seventh ventral plate with triangular wings, outer margin of each somewhat concave; no distinct lobes basally or apically; tooth-like processes very long, slender, and curved; membranous flap typical of the group, (fig. 43). Eighth ventral plate very distinct from preceding species; distal pedicel rather long, ending in two lobe-like flaps, sparsely haired, (fig. 46). When viewed laterally this plate shows a rounded notch near apex, (fig. 47). A similar notch is found in the species *rudbeckiæ*, etc., but is not so conspicuous.

Female.—Not known, or indistinguishable; probably one of the forms that have not yet been associated with their males.

Habitat.—Not very well known; the Baker collection includes specimens from Colo., N. M., Calif. and Cana.

Specimens examined: 12 males. The description is based upon a specimen (probably cotype) sent by Professor Cockerell from Colorado.

This is a very distinct, well marked species, both in external and in genital characters. It is nearest related to the following, but quite unlike it in many respects. In puncturation it greatly resembles *P. episcopalis* Ckll., but is entirely different in other characters. From the small series at hand there appears to be little variation in the species, but more material may prove the contrary. The only variation noticeable, aside from size, is in the basal width of the clypeus, which varies from the typical, (fig. 86), to forms in which it is about one and a half times the width of the lateral area.

P. tridens Ckll. unquestionably belongs to this species if the description given for it is characteristic. The differences were given as being somewhat more dense puncturation of the first abdominal segment, 1 mm. difference in length, and other equally variable characters. I have the lots from which these were described and find only the one species. Five of these have been dissected and are identical in genitalia, as described.

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PROSOPIS GROSSICORNIS Swk. and Ckll. 1910.

1910. *P. grossicornis*, Swk. and Ckll. Ent. News. 21 : 67.

Male.—Distinguished by its small size, impunctate abdomen, faintly punctured head and thorax, and face marks resembling those of *P. tridentulus*. Small, about 4½ mm., resembling *P. cressoni* in size, form and puncturation.

Sculpture.—Very sparse and light on head and thorax, resembling in this respect, forms of *P. cressoni;* enclosure of propodeum often smooth.

Yellow Markings.—Face marks almost identical with those of *P. tridentulus*, except in size, and as follows: Supraclypeal mark seldom extending above antennal sockets; clypeus always broad at base; scape normally with a yellow stripe in front; and labrum and mandibles dark. Thorax without markings. Legs with most of tibiæ and tarsi yellow, except median third of middle and hind tibiæ.

Genitalia.—Armature almost identical with that of *P. cressoni*, and *P. rudebeckiæ*, not at all like that of *P. tridentulus*. Ventral plates very similar to those of *P. tridentulus*, except in size, and in the distal pedicel of eighth being shorter, (figs. 19, 42, 48).

Female.—Unknown or indistinguishable.

Habitat.—Not well known. Specimens at hand are from Neb., Wisc., Alab. and Cana. Type locality Lincoln, Neb., May 14, 1901. Taken on flowers of Tamarix gallica (L. Bruner).

Specimens examined: Type, loaned by Swenk, and six specimens in the Baker collection. The description is based upon the type, except for the genitalia, which are from the others.

This little species is very interesting in being related to *P. cressoni* so closely in size, form, puncturation, and genital armature, and to *P. tridentulus* in markings and ventral plates. The seven specimens are practically identical in sculpture and markings, and the genitalia show no variation whatever. Only one specimen shows much variation in marks; this lacks the yellow on scape, and has less clearly cut face marks, (fig. 84) and (fig. 87).

It is not improbable that the insect described by Cockerell as *P. digitata fedorica*, (1909 Ann. and Mag. Nat. Hist. Ser. VIII, 4:27) belongs to this species, as the description would indicate: in which case the name would have to be changed to *P. fedorica* Ckll., but not having any authentic specimens of the latter I am not prepared to make the change.

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PROSOPIS VARIFRONS Cr. 1869.

1869. *P. varifrons*, Cr. (female). Proc. Bos. Soc. Nat. Hist. 12:270.
1869. *P. varifrons*, Cr. (male). Proc. Bos. Soc. Nat. Hist. 12:271.
1890. *P. varifrons*, Ashm. Bull. Colo. Biol. Assn. 1:21.
1895. *P. varifrons*, Slosson. Ent. News. 6:5.
1899. *P. varifrons*, Birk. Ent News. 10:244.
1901. *P. varifrons*, Ckll. Psyche. 9:283.
1901. *P. varifrons*, Lov. Ent. News. 12:9.
1903. *P. varifrons*, Ckll. Psyche. 10:74.
1806. *P. varifrons*, Ckll. Bull. Amer. Mus. Nat Hist. 22:423
1906. *P. antennata*, Ckll. Bull. Amer. Mus. Nat. Hist. 22;423.
1910. *P. varifrons*, Lov. Psyche. 18:184.

Male.—Known by large, swollen scape, truncate lateral face marks, with projection over antennal sockets; black collar; and distinct genitalia.

Length about 5–6 mm. Head normal; face rather long; scape greatly swollen; clypeus short, broad; supraclypeal area longer than broad below antennal sockets, which are very close together. Metanotum very short.

Sculpture.—Head and thorax heavily punctured. Front, vertex and occiput heavily, confluently, punctured, punctures extending somewhat down on to cheeks. Mesonotum closely, almost confluently punctured, with rather small punctures; scutellum confluently, almost rugosely punctured; metanotum rugulose. Bowl of enclosure of propodeum small, not clearly defined; it and surrounding area at base rugosely pitted, with rather small, subquadrate pits; neck narrow, forming a groove; lateral areas of posterior face, and sides rugulose. Mesopleura densely punctured, with medium sized, round punctures; metapleura somewhat striate, rugose. Abdomen practically impunctate.

Yellow Markings.—Lateral face marks stout, filling lateral areas, truncate just above upper level of antennal sockets, with projection following outline of socket part way along upper border; supraclypeal mark long, extending in a narrow process up between antennal sockets, (fig. 85). Yellow stripe on front of scape; spot on tubercles, front of fore tibiæ, base of middle and hind tibiæ, and basitarsi yellow.

Genitalia.—Not closely resembling any other species. Armature similar to that of *P. tridentulus* in having large cardo and heavy stipites, with small superior lobe curving in abruptly, and rather densely haired apical portion, (fig. 17). Seventh ventral plate with long, pointed wings; the basal lobe being unusually long, narrow, and hairless; outer margin notched at a point about two-thirds of the way toward apex; with a tuft of fine hairs on the knob-like projection, and a fringe of long, narrow, tooth-like processes from there to apex; membraneous flap transparent, slightly haired at tip, (fig. 41). Eighth

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ventral plate unlike that of any other species; apical lobes not well separated, merely broad, thin, extensions of the pedicel with a few spine-like hairs apically, (fig. 45).

Female.—Distinguished by its comparatively large size, dark collar, narrow lateral marks on face, heavily punctured head and thorax, and impunctate abdomen with glossy first segment. Somewhat larger than the male which it resembles in general structure.

Sculpture.—Practically the same as that of the male, but more sparse punctures on thorax.

Yellow Makings.—Face marks limited to narrow stripe on each side of face, usually not extending above antennal sockets, (fig. 130). Spots on tubercles, and sometimes on tegulæ, and spots at base of tibiæ yellow.

Habitat.—Apparently not restricted, but found in greater numbers in the Rocky Mountain States. Probably 90 per cent. of the specimens have been taken in Colo., N. M. and surrounding States. It has been found, however, in the eastern States and in Canada. Recorded on *Scrophularia*, *Cratægus*, *Lappula*, *Cleome*, *Linum*, *Dasiphora*, *Pentstemon*, and *Phacelia*.

Specimens examined: about forty, from Colo., N. M., and Canada.

This species is very well marked, and clearly differentiated from all others: it has no near relatives, but probably most resembles *P. tridentulus* Ckll. The eighth ventral plate is entirely distinct, being of a different form than the others, but is nearest to that of *P. tridentulus*, as is the armature. So far as known there is little variation in this species, especially in the males, of which there are over thirty in the collection at hand. The females closely resembles forms of *P. episcopalis* Ckll., but the variation is in the latter species. I think it highly probable that *P. elliptica* Kirby, (1837), is the same as this, but until some authentic descriptions, or specimens can be obtained the older name will have to be ignored.

THE MODESTUS DIVISION.

This division is characterized in the males by the short, simple, truncate, distal pedicel of the eighth ventral plate, lacking apical lobes and pubescence; by the simple, hairy wings of the seventh ventral plate, without tooth-like projec-

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tions, and without a basal lobe produced by an invagination; and by the confluent, comparatively narrow upper extensions of lateral face marks.

The four species, with their varieties, included herein, form the most compact, nearly related group in the genus, but one in which the greatest range of variation is found within a species. Apparently the entire division is composed of offshoots from the *modestus* stock, for this species seems to be breaking up into an endless number of forms. Thruout the division the gradual evolution is apparent in genital, as well as external characters, and consequently less emphasis can be laid upon these in classification.

PROSOPIS MODESTUS Say. 1837.

1837. *Hylæus modestus*, Say. Bos. Jour. Nat. Hist. 4:392.
1859. *H. modestus*, LeConte. Writ. Thom. Say. Ent. 2:771
1887. *Prosopis modestus*, Cr. Syn. Hymen. N. Amer., 1887, p. 291.
1890. *P. modestus*, Ashm. Bull. Colo. Biol. Assn. 1:31.
1895. *P. modestus*, Rob. Tr. Am. Ent. Soc. 22:116.
1896. *P. modestus*, Rob. Can. Ent. 28:136.
1898. *P. modestus*, Ckll. Ent., 1898, p. 216.
1901. *P. modestus*, Lov. Ent. News. 12:5, 162.
1901. *P modestus*, Rob. Ent. News. 12:78.
1904. *P. modestus*, Rob. Can. Ent. 36:273.
1909. *P. modestus*, Lov. Ent. News. 20:413.
1910. *P modestus*, Lov. Psyche. 17:182.
Syn. *P. sparsa* Cr.
1869. *P sparsa*, Cr. Proc. Bos. Soc. Nat. Hist. 21:271.
1901. *P. sparsa*, Lov. Ent. News. 12:8.
Syn. *P. flammipes* Rob.
1893. *P. flammipes*, Rob. Tr. Amer. Ent. Soc. 20:273.
1901. *P flammipes*. Lov. Ent. News. 12:7.
Syn. *P floridiana* Rob.
1893. *P. floridiana*, Rob. Tr. Amer. Ent. Soc. 20:273.
1901. *P floridiana*, Lov. Ent. News. 12:7.
Syn. *P pennsylvanica* Ckll.
1896. *P. pennsylvanica*, Ckll. Psyche. 7:439.
1901. *P. pennsylvanica*, Lov. Ent. News. 12:8.
Syn. *P. citrinifrons* Ckll.
1896. *P. citrinifrons*, Ckll. Psyche Supp. 7:27.
1901. *P. citrinifrons*, Lov. Ent. News. 12:8.
1904. *P. citrinifrons*, Vier. Can. Ent. 36:93.
Syn. *P. triangularis* Ckll.

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1896. *P. triangularis*, Ckll. Psyche Supp. 7:31.
1901. *P. triangularis*, Lov. Ent. News. 12:8.
Syn. *P. sayi* Rob.
1904. *P. sayi*, Rob. Can. Ent. 36:274, 5.
Syn. *P. eulophi*, Rob.
1905. *P. eulophi*, Rob. Can. Ent. 37:236.
Syn. *P. supracurta* Swk. and Ckll.
1910. *P. supracurta*, Swk. and Ckll. Ent. News. 21:71.

P. modestus var. MINYRA, (Lov.).

1909. *P. minyra*, Lov. Ent, News. 20:413.

P. modestus var. ILLINOIENSIS (Rob.)

1896. *P. illinoiensis*, Rob. Can. Ent. 28:138.
1897. *P. illinoiensis*, Rob. Tr. Ac. Sc. St. Louis. 7:315.
1901. *P. illinoiensis*, Lov. Ent. News. 12:7.
1904. *P. illinoiensis*, Rob. Can. Ent. 36:274, 5.
1910. *P. illinoiensis*, Lov. Psyche. 12:182.

Typical Male.—Recognized by its rather broad face, short lateral marks, which are truncate, or narrow to tip a short distance above antennal sockets; and impunctate, or delicately punctured abdomen; together with the genitalia.

Rather stout; head broad; scape moderately stout, not conspicuously excavated on outer side; face broad, not narrowing suddenly below; clypeus stout, but space between clypeus and eye at narrowest point comparatively broad, not narrow; base of clypeus about equal to width of lateral areas at same level.

Sculpture.—Front and vertex thickly punctured with small, irregular, confluent punctures; striate laterad. Mesonotum thickly punctured with medium sized, round punctures, separated by about one-half the diameter of one puncture; scutellum with considerably larger, more separated punctures; metanotum rugose, about one-half the length of the scutellum. Enclosure of propodeum funnel shaped on posterior face, rapidly broadening on superior face, and covered with long, subquadrate pits on lateral portion; sides rugose dorsad, rugulose ventrad; lateral areas almost smooth. Mesopleura moderately, shallowly punctured; punctures about the size of those on mesoscutum, but less close; metapleura depressed, striate dorsad, rugose ventrad. First abdominal segment glabrous, with very few fine punctures; remaining segments impunctate.

Yellow Makings.—Lateral face marks stout, not narrowing to mere stripes below, but filling lateral areas, and remaining stout to lower end, (fig. 93); above narrowing to tip on eye margin somewhat above antennal sockets; supraclypeal mark quadrate, not extending above antennal sockets. Tubercles and spot on each side of collar yellow.

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Anterior tibiæ in front basal third of middle and hind tibiæ, and basitarsi yellow; remaining tarsi brown.

Genitalia.—Armature rather stout; cardo short, broadly rounded at apex; stipes stout, superior lobe not abrupt but rounding at distal end, rather short; apical portion stout, rounded, with long hairs; sagittal rods appearing narrow from above when in their normal position, ending about even with stipites; volsella comparatively small, (fig. 12). Eighth ventral plate short, simple, hairless; basal piece normal; distal pedicel short, truncate, slightly broadened at apex, (fig. 25). Seventh ventral plate stout; wings short, pointed at apex, without membranous flap; basal lobe prominent, almost as large as remainder of wing; apical portion with few long hairs, especially near tip; extremity of basal lobe with a tuft of short hairs, (fig. 69).

Typical Female.—Rather large, about 6 mm. long; stout, face broad; lateral areas below comparatively broad, as in the male; supraclypeal area below antennal sockets twice as broad as long, much broader than lateral areas at same level; scape long narrow.

Sculpture.—Similar in general to that of male. Occiput almost smooth; mesoscutum with quite small punctures; mesopleura with small sparse punctures, separated by twice the diameter of one puncture. Abdomen impunctate; first segment polished. Otherwise as in male.

Yellow Markings.—Lateral areas of face each with a broad, short irregular blotch, extending from level of antennal socket down almost to the narrowest point of the lateral area, not touching eyes or clypeus, (fig. 136). Tubercles, two lines on collar, and base of tibiæ yellow.

Var. MINYRA (Lov.).

Male.—Differs from the typical form in being very small, only about 4 mm. in length, and in having long upper extensions of lateral face marks of almost uniform width, (fig. 100).

Var. ILLINOIENSIS (Rob.).

Male.—Differs from typical form in having face marks not pointed on eye margin, but slightly separated at apex, and often stouter.

Habitat.—Practically all of North America except the Pacific coast.

Specimens examined: about 250. Localities include Wisc., Me., Ind., Pa., Mass., Mich., Ill., Neb., Colo., Tex., Va. and Queb. Males dissected: about 30. Plants recorded as visited by this species: *Aralia*, *Solidago*, *Rubus*, and *Eupatorium*.

This is an exceedingly variable species in size, markings, sculpture, and somewhat in genitalia. Some specimens from Texas, a number from Wisconsin, and a few from other

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localities are very small, about the size of *P. cressoni*. The largest specimens are from Canada, both males and females but the size does not depend especially upon the locality, for there are a number of very small Canadian specimens as well as large southern ones. In face marks the males vary greatly; some having the typical lateral marks remaining broad to the upper edge of the antennal sockets and then tapering off as in figure (98); others ending almost abruptly on a level with the antennal sockets as in figures (93–95); while still others have longer, less tapering marks as in figures (96, 99, 100); and between all of these are all sorts of intermediates, some of which are shown in the series of figures (93–100). There is no uniformity whatever in these variations, either according to the size of the specimen, the locality in which it was taken, or any other distinguishable factor. There is simply an exceedingly strong tendency to vary thruout the entire species, and series from practically any locality will show almost any of the modifications. In thoracic markings also, there is no regularity; often the collar is entirely black; usually the tegulæ and wing bases are black, and the tibiæ and tarsi may have almost any amount of yellow from a mere spot on each tibia to entirely yellow tibiæ and tarsi both. In some specimens the labrum and mandibles are yellow as in *P. ziziæ*, but as a rule they are dark. In puncturation the same sort of variation is found, within certain limits; the punctures of the head and thorax are considerably more dense in some specimens than in others; and the basal segments of the abdomen vary from absolutely smooth to quite conspicuously, altho sparsely, punctured. Upon none of the above characters can distinct separation be based, because they are entirely untrustworthy.

In this species far more than in any other is there a tendency toward variation in the genitalia. The only place in which this is exhibited clearly is in the seventh ventral plate, for the eighth is so simple as to allow of almost none. In the former a series of variations is found including all forms intermediate between the two most extreme ones shown in figures (69 and 72), the former having very broad, short,

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stout, wings, with the basal lobe larger than the apical portion, and the latter with long, narrow apices, and basal lobes extending backward, rather than at right angles to the remainder. All such forms as are shown in figures (69 to 72), under *modestus* and *episcopalis* are represented in the series of dissections I have made of *modestus* alone. No connection can be made, however, between the shape of these plates and the shape of the face marks, for specimens agreeing in face marks may have all the various forms of ventral plates, or vice versa. Likewise there is no connection between the shape of these and the range of the specimen, any more than with the markings. Nothing whatever can be distinguished to connect any of the variously modified specimens into groups that can be said to have any reliable diagnostic characters to warrant specific separation, or even good varietal separation. It is necessary, however, that some sort of division be made to distinguish as far as possible the two or three most extreme modifications, and I have indicated these as varieties, altho it is very doubtful whether they should be called more than forms.

The characters of the female are even more variable than those of the male. The above description is of a typical Indiana specimen, but does not by any means hold true for all. The face marks are usually larger than those illustrated, covering the entire lateral areas, or at least all below the base of the supraclypeal area. In some specimens, however, the marks are much more reduced than those figured, being mere irregular strips. Only very seldom do the marks become so prominent as to include any of the clypeus, altho in an occasional specimen spots will be found on it. In thoracic markings and puncturation the same variations occur as in the males. And as in the males also, there is no regularity, or uniformity in the variations, so that no distinct division can be made. There are over 125 specimens in my material, from all parts of the range given above, and yet it is impossible to separate this series into any definite groups that can be of use.

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Under the heading *P. modestus* I have provisionally placed eleven forms previously described as species. Eight of these were described from males, and three from females, as follows:

P. sparsa, female, described in 1869 by Cresson, as differing from *affinis* Sm. by, "punctures of head and thorax being much more sparse, and by the subquadrate head": otherwise agreeing with the description of a typical female of *P. modestus*. The species that has been called *affinis* in this country does not differ from *modestus* in the female enough to be easily distinguished, and in all probability the specimen described by Cresson is *modestus*, as this species is by far the more common one. At any rate it is certainly one of the two, according to the description, and comes in this group, because the characters given above cannot be of any value in diagnosis. It is also noticeable in this, as in most of the other synonyms mentioned, that there is no record of the "species" since it was first described, as no one could recognize it.

P. flammipes, female, was described in 1893 by Robertson, from a Florida specimen. The description fits that of *modestus*, except for the "first and base of second segments of abdomen rufous", which character is of no value unless supported by others. Many specimens are found that have various amounts of reddish color on the basal abdominal segments, without regard to species. If the rufous tinge is constant and accompanied by other characters the specimen mentioned may represent a distinct species, but no indication of this is given, and there is every reason to believe that it is only one of the forms of *P. modestus*. No one but Robertson, apparently, has ever recognized it.

P. floridana, female, was described by Robertson in 1893, also from Florida. It was distinguished from *P. affinis* Sm. "by somewhat smaller size, clearer wings, paler ornaments, by having spots on face more elongate, and hind tarsi whitish at base". There is absolutely nothing in this to distinguish it from *modestus*, so this is the only place for it, at least until further characters are given.

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P. pennsylvanica, male, described by Cockerell from Pennsylvania specimens, agrees perfectly as far as the description goes, with the form of *modestus* having the lateral face marks only slightly notched by the antennal sockets, and receding to a point on the orbital margin. Cockerell says of this, "it looks most like *modestus* at a glance, but differs in the shape of the face marks". The shape of the face marks, however, correspond to the form mentioned, so that no distinction of this nature can warrant specific separation. I have examined a specimen of this in the Cockerell collection, and found nothing to distinguish it from *modestus*.

P. citrinifrons, male, was described by Cockerell in 1896, from Colorado specimens. This also agrees with the description of *modestus* as given, except in the "prothorax dark, except yellow on tubercles". I have the Baker collection containing the lot from which the type of this was taken, and find in it several specimens without yellow on the collar, but they are merely forms as indicated. Dr. Howard writes that the species is known only by its unique type in the National Museum, which would indicate that the specimen is only one of those lacking the collar markings.

P. triangularis, male, was also described in 1896 by Cockerell, from Georgia specimens. The description is very complete in external characters, but gives nothing to distinguish the specimens from a form of *modestus*, having narrowed upper lateral face marks. The description stated, "it might be confounded with *affinis*, but is larger, the supraclypeal mark is much longer, and the wings are darker". The size, supraclypeal mark, and shade of wings are of *no value*, and nothing else is given that could distinguish the specimen. What Professor Cockerell probably took for *affinis* at that time was a form of *modestus*, for his description of the face marks could not possible indicate *P. ziziæ* which has usually been taken for *affinis*.

P. sayi, male, was described in 1904, by Robertson, from Illinois specimens. The only distinction given between this form and that called *illinoiensis*, is that it has the lateral face marks pointed on the eye margin and tegulæ often with yel-

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low. Robertson says concerning it, "according to my separation of them *P. illinoiensis* sometimes has a dot on the tegula, and *P. sayi* often has". Obviously such a distinction is worthless. I have examined specimens supposedly of this, identified by Cockerell, Swenk, and others, no two of which agree, and all of which are only forms of *modestus*.

P. eulophi, male and female, described by Robertson in 1905, from Illinois specimens, is indistinguishable by the description. This cannot be placed definitely until the types are examined. The description states, "face narrowed nearly one-half below,—face below antennæ whitish, on eye margin pointed as high as middle of scape", etc. I have provisionally included this here because the rest of the description of the male, and the description of the female agree with *modestus*, and as far as can be told from the statement about the markings they also agree.

P. supracurta, male, was described by Swk. and Ckll. in 1910, from a Colorado specimen. The description states, "very similar to the same sex of *P. sayi* Rob. but basal abdominal segment more strongly punctured,—may prove to be only a subspecies of that form". I have before me the type of this from Mr. Swenk, and find it indistinguishable except as one in the series of forms. The face of the specimen is shown in figure 96.

P. modestus var. MINYRA, (Lov.).

This form was described as a distinct species from Virginia specimens. The extreme specimens are distinguished by being very small, and having long upper extensions of lateral marks as described. Only the extreme individuals, however, can be distinguished from the ordinary ones and this in a purely arbitrary manner. Along with specimens of this are found every variation in size and markings between it and the others. In a series from Wisconsin containing a number of these small specimens the intergradation is shown perfectly, many of the smallest having shorter, tapering lateral marks, or even marks that are almost truncate at the level of the antennal socket; and other specimens of much larger size have the long marks well formed; in genitalia they show

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the same range as any other series of the species. This variety, like the var. *magniclavis* under *P. cressoni*, is one in which the yellow markings are strongly emphasized, but otherwise it is like the small specimens of the other forms.

P. modestus var. ILLINOIENSIS, (Rob.).

Robertson described this as a distinct species having the face marks somewhat club shaped laterally, instead of narrowing on eye margin as in *sayi*. Robertson did not recognize *P. modestus* at that time, and described this and *sayi*, to include what had been called *modestus*. There is a large amount of material of this general description in the series of *modestus*, at hand, including a number that have been identified as *P. illinoiensis* Rob. but it merely composes part of the group as discussed above. The form "*P. sayi*" of Robertson is the typical *modestus*, and "*P. illinoiensis*", includes those having the stout, or slightly club shaped lateral marks. This division is purely arbitrary, and will not, as Robertson himself indicated, serve to separate any but the individuals which happen to be so marked. Nevertheless it is useful for this, and very serviceable in separating large lots into general groups.

In all the above forms the main characteristics distinguishing *modestus* are found. That is, the impunctate or very sparsely punctured abdomen, the comparatively broad face, and stout scape of the males serve to distinguish them from the other species having similar genitalia. The relationship between them and some of the following, however, is very close, as will be seen.

Whether or not the species now known as *modestus* is the same as the original species described as such by Say, is a debatable question. The types are no longer in existence and very little can be determined from the original description, but for many reasons it seems advisable to retain the name, now so long and widely used; especially since it is applied only to this one species and can cause no confusion. This question is discussed more in detail by Mr. Lovell (Psyche. 10:182, 3), whose conclusion I have adopted.

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PROSOPIS ZIZIÆ Rob. 1896.

1896. *P. affinis*, Rob. Can. Ent. 28:136.
1896. *P. ziziæ*, Rob. Can. Ent. 28:136.
1898. *P. ziziæ*, Ckll. Ent. 31:187.
1898. *P. ziziæ*, race *dunningi*, (male), Ckll. Ent. 31:188.
1901. *P. affinis*, Lov. Ent. News. 12:6.
1901. *P. ziziæ*, Lov. Ent. News. 12:162.
1904. *P ziziæ*, Rob. Can. Ent. 36:274.
1909. *P. ziziæ*, Lov. Ent. News. 20:414.
1910. *P. ziziæ*, Lov. Psyche. 17:181.

Male.—Resembles male of *P. modestus* in size and form, may be distinguished by the long, heavy upper processes of the lateral face marks, the slender, curved scape, usually with a yellow stripe, and by the different genitalia.

Scape swollen, rather slender, concave laterad and caudad; clypeus rather long, narrower at base than lateral areas at same level.

Sculpture.—Not appreciably different from that of *P. modestus*.

Yellow Markings.—Lateral face marks heavy, filling lateral areas and extending one-half the length of scape along eye margin, not narrowing but rather broadening to rounded or truncate apex; supraclypeal mark rather long, portion below antennal sockets quadrate; scape usually with yellow stripe in front; labrum and mandibles usually with yellow, (fig. 101). Collar, tubercles, sometimes tegulæ and wing bases with yellow. Legs marked as in *modestus*.

Genitalia.—Similar to those of *P. modestus*, except the seventh ventral plate, which has broad, somewhat triangular, but rounded wings, without distinct lobes, and largely covered with long hairs, but without the basal tuft found in related species, (figs. 11, 26, 29).

Female.—Only typical specimens are distinguishable from the same sex of *P. modestus*, and these only by the larger lateral face marks, which almost fill the lateral areas and extend some distance along the eye margin as shown in figure (No. 138); and by the yellow on tegulæ and wing bases.

P. ziziæ var. DUNNINGI (Ckll.).

This form was described as *P. ziziæ* race *dunningi*, by Cockerell, from South Dakota specimens, but has since been separated as a species. Professor Cockerell's first determination, however, is undoubtedly the correct one. I have specimens from Colorado and Nebraska, the latter determined by Swenk, who has for some time worked in conjunction with Professor Cockerell, and they are unquestionably *ziziæ*. The characters distinguishing it from the typical form are:

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"lateral face marks broadened and squarely truncate at ends", (fig. 102), and quite strongly punctured first abdominal segment, (not always true). The seventh ventral plate, at least in some specimens is broader than usual, (fig. 30).

Habitat.—About the same as that of *P. modestus.*

Specimens examined: About 60. Localities represented: Ill., Mass., Me., Kans., N. J., La. and Queb. Recorded on flowers of *Solidago*, *cultivated raspberry*, *cultivated blackberry*, *Castanea*, *Lomatium*, *Rubus*, *Symphoricarpus*, and *Melilotus.*

The males of this species are usually very distinct and easily recognized by their face marks; and can always be distinguished by the characters of the seventh ventral plate. Some specimens lack the yellow stripe on the scape, and many are without yellow on the tegulæ and labrum. Apparently the variation is less in this species than in *P. modestus*, but a much larger series will have to be obtained before this can be established. In range it is not distinct from *P. modestus*, as some writers have thought, but coincides with it, so far as can be judged from the present data.

In the female sex separation is much more difficult than among the males, in fact it is only the well marked, typical forms that can be separated with any certainty at all. I have specimens taken at the same time and place with typical males, but which are indistinguishable from specimens of *P. modestus.* Probably many of those included under the latter belong to this species, but as the other is the more variable species in the males I have placed the questionable ones under it. Unless some new characters are discovered for differentiation these will have to remain as intermediates.

PROSOPIS EPISCOPALIS Ckll. 1896.

1896. *P. episcopalis*, Ckll. Psyche Supp. 7:29.
1901. *P. episcopalis*, Lov. Ent. News. 12:8.
Syn. *P. universitatis*, Ckll.
1906. *P. universitatis*, Ckll. Ann. and Mag. Nat. Hist. Ser. VII. 17:225.

P. episcopalis var. SUBTRISTIS (Swk. and Ckll.).

1910. *P. subtristis*, Swk. and Ckll. Ent. News. 21:70.

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P. episcopalis var. COQUILLETTII (Ckll.).

1896. *P. coquillettii*, Ckll. Psyche. 7:439.
1901. *P. coquillettii*, Lov. Ent. News. 12:8.
1903. *P. coquillettii*, Ckll. Psyche. 10:74.

Male.—Typical specimen easily known by the face marks, the yellow on scape, and the coarsely, shallowly, heavily punctured dorsum of abdomen.

Rather long, slender, about 6–7 mm. in length. Face long, narrow, not strongly convergent below; scape moderate, concave exteriorly; clypeus long, 2½–3 times as long as broad at base; supraclypeal area below antennal sockets quadrate. Apex of first abdominal segment with usually a white fringe of pubescence.

Sculpture.—Front, vertex, and occiput with dense, confluent, but not rugose puncturation, becoming shallower and striate on cheeks. Mesoscutum closely punctured with medium sized, clear cut, round punctures, somewhat smaller than those of head; scutellum with larger, more separated punctures; metanotum rugose. Propodeum normal in shape and sculpture; bowl of enclosure with large, subquadrate, shallow pits; lateral areas rugose to rugulose. Mesopleura rather heavily punctured, with punctures larger than those of the scutum, separated by about one-half the diameter of one puncture; metapleura rugose, striate. First segment of abdomen smooth, conspicuously punctured with small punctures, separated by two to three times the diameter of one puncture; segment two similarly but more densely punctured; segment three and those following with punctures becoming much larger, more shallow and not so clear cut, but heavy, coarse, and very conspicuous; apices of segment two and following noticeably raised; punctures of all segments more dense laterad, and more sparse and shallow on venter.

Yellow Markings.—Face marks somewhat similar to those of *P. ziziæ*, but narrower, and upper extension of lateral marks shorter and narrower, (fig. 103). Scape with yellow stripe in front; labrum and mandibles with yellow spots. A strip on each side of collar, tubercles, and tegulæ yellow. Legs with front of fore tibiæ, base and apex of other tibiæ, and basitarsi yellow; apical tarsi brownish.

Genitalia.—Practically identical with those of *P. modestus*, (figs. 13, 27, 73).

Female.—Typical specimen distinguished by the long lateral face marks, long clypeus, and abdomen punctured as in the male.

Resembles male in general form and sculpture; face long; clypeus barely broader at base than lateral areas at same level; narrowest space between clypeus and eye relatively broad; scape as in other females, long and narrow, (fig. 139).

Sculpture.—Practically identical with that of male in typical form.

Yellow Markings.—Face marks filling lateral areas, extending short

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distance above antennal sockets, narrowing to eye margin. Thoracic markings as in the male. Legs with very small spot at base of each tibia, remainder black.

P. episcopalis var. SUBTRISTIS (Swk. and Ckll.).

Male.—Differs from typical specimens only in having no yellow on scape, collar, or tegulæ, and very little on tubercles, and having less on labrum, mandibles and legs.

Female.—Differs from typical form in having variable, smaller, face marks, no yellow on collar, tegulæ, or legs, except base of hind tibiæ, and in having more sparse punctures on abdomen. The extremes of this are very large, rather stout, black forms, quite similar to females of *P. varifrons*, (fig. 132).

P. episcopalis var. COQUILLETTII (Ckll.).

Male.—Differs from typical *episcopalis* in having long lateral face marks, extending almost to top of orbit, (fig. 104), almost entirely yellow fore and hind tibiæ and tarsi, coarsely, confluently punctured abdomen, and smaller size.

Female.—Abdomen almost impunctate; pleura heavily punctured; markings like those of typical form. Almost indistinguishable from same sex of *P. ziziæ*, (fig. 139).

Habitat.—So far as known the Western, and Southern States.

Specimens examined about 100, from Colo., N. M., Nev., Calif., and Tex. Recorded on flowers of *Pentstemon*, *Symphoricarpus*, *Malvastrum*, and *Drymocallis*. Altitude records range from 1000–8000 feet.

This species apparently supplants *modestus* and *ziziæ* in the extreme Western States, and partly on the east slope of the Rocky Mountains. Like the eastern species to which it is nearly related it is quite variable in a number of characters. The greatest difference between this and the eastern species is its coarsely, shallowly punctured abdominal segments, and the noticeably raised apices of these segments. These characters are uniform in the series of fifty males before me, except in the variety *coquillettii*, which can be distinguished in other ways. The face markings of the male are quite constant thruout, but the thoracic markings show a wide variation. Present material falls into two groups on these characters; eleven specimens from Colorado agreeing with the typical form, and thirty odd specimens, nearly all from Ormsby county, Nevada, differing as follows: Somewhat

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variable, but all having dark collars, and usually more restricted yellow markings on legs and thorax. These I have designated "var. *subtristis*."

Of the females thirteen specimens from Colorado and California agree in general with the description of the typical form, except that they vary considerably in size, while about thirty specimens, mainly from Nevada have almost no yellow on legs or thorax, and very reduced face marks, and have no yellow on the collar. These, corresponding to the dark male form, are designated "var. *subtristis*." They are exceedingly variable in size, form and markings, as well as puncturation of abdomen, some having almost no punctures except on second or third segments and very few here. The varietal name is taken from the form of which the female was described by Swenk and Cockerell as *P. subtristis* (Ent. News. 21:70). I have a paratype of this from Mr. Swenk, which is identical with the series of Nevada specimens, being merely one of those with the almost impunctate abdomens. The most extreme of these specimens cannot be distinguished from females of *P. varifrons*, Cr. This group of females, like that including *modestus*, and *ziziæ*, or that containing *coloradensis*, *wootoni*, etc., is very homogeneous and variable, and only typical specimens can be determined with certainty.

The variety *coquillettii* is based upon the description of *P. coquillettii* Ckll., (Psyche. 7:439), and upon two male specimens from Texas agreeing with this description. Cockerell's specimen was from California, but none of my specimens from this region correspond to it. The two males from Texas, however, are certainly identical with it if the description is accurate. They are easily recognized as a variety, but have no characters to warrant their separation as a species, being merely a better pigmented form such as may be found in southern groups of many species. The description of the female of this variety is based upon two specimens from the same place as the males. I have provisionally put them here, altho they could be equally well put with the *modestus* group, on account of their small size and almost impunctate abdomen.

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P. ænigmus Vier. so far as can be told by the description, (Insects of Beulah, New Mexico), certainly belongs to *P. episcopalis*. It is described as differing by, "disc of metathorax rugose, with no large, shining pits as in *episcopalis*", which character is utterly valueless for separation. Similarly *P. universitatis* Ckll. is only differentiated upon minor differences in the face marks, shade of flagellum, and black collar (Ann. and Mag. Nat. Hist. Ser. VIII, 17:225). This is probably the variety *subtristis*.

PROSOPIS FOSSATA n. sp.

Male.—Easily distinguished by its large size, coarse, confluent puncturation over head and thorax, fossa and grooves of propodeum, long narrow basal segment of abdomen, and entirely dark collar.

Length about 6–7 mm. Slender; scape moderate, concave laterad; flagellum very long, light beneath; face long, narrow; clypeus less than half as broad at base as at apex, equal in width to lateral areas at base; thorax slender, flattened; propodeum long; posterior face not clearly outlined; abdomen slender, first segment almost conical.

Sculpture.—Practically entire body except abdomen, coarsely, rugosely, confluently punctured. Front, vertex and occiput with confluent, rugose, striate punctures, extending down onto cheeks. Pronotum confluently punctured over entire surface; mesoscutum coarsely, confluently punctured, almost rugose over entire surface; scutellum similar but disc more sparsely punctured; metanotum rugose, almost pitted. Enclosure of propodeum abnormal; entire bowl on superior face, lateral margins not curved but straight, in form of ridges, converging to a large, deep fossa which takes the place of the usual neck; bowl entirely covered with irregular pits; laterad of the apex of the bowl are deep, irregular grooves, or excavations, running into the fossa, below which are more irregular, very deep pits extending over the posterior face and onto the sides of the propodeum; the margin of the posterior face is bordered by a high, sharp, irregular ridge except at top of fossa where it arches over. Mesopleura with large, deep, irregular, confluent punctures, almost pit-like, varying in size and shape and separated by sharp ridges; metapleura depressed ventrad, short, broadened above, margins becoming indistinct among the coarse punctures. Abdomen absolutely impunctate, first segment glossy, and rufous, remainder dull black.

Yellow Markings.—Face marks strongly resembling those of *P. episcopalis*, (fig. 105), but lack yellow on labrum and mandibles. The only thoracic marks are spots on the tubercles. Legs with front of fore tibiæ, base and apex of other tibiæ, and all tarsi yellow.

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Genitalia.—Very similar to *P. modestus* and *episcopalis*, but armature longer and heavier, especially stipites, (figs. 14, 28).

Female.—Recognized by its coarse puncturation, large, long, lateral face marks, yellow on collar, and impunctate abdomen with red basal segment. Slightly larger than the male which it resembles in form.

Sculpture.—Puncturation as in the male, exceedingly coarse and heavy thruout. Propodeum lacking the fossa of the male, but coarsely pitted at base; neck of enclosure narrow forming a groove. Abdomen as in the male.

Yellow Markings.—Very conspicuous, lateral face marks filling lateral areas and extending well above base of antennæ, terminating abruptly on eye margin. Entire collar except small space in center, tubercles, spot on tegulæ, front of fore tibiæ, base of middle tibiæ, practically all of hind tibiæ, and all tarsi yellow.

Habitat.—Unique male type from Louisiana, in collection of C. F. Baker, (No. 2336). Unique female from Alabama, in collection of C. F. Baker. (No. 2296). No other data given.

There is no chance for confusing this with any other species known to me. The coarse, dense, pit-like punctures over entire head and thorax, with the immense, deep fossa of the propodeum of the male, the great pits and ridges of its lateral surface, and the comparatively narrow, V-shaped enclosure entirely on the superior face, are found in none of the other species, and serve to distinguish it at a glance. The species described by Robertson as *P. nelumbonis* may possibly be the same as this if the red basal segment of the abdomen is characteristic, as this is the distinguishing feature given for that species. However, as there was nothing else given in the description to indicate relationship there is no way of deciding until Robertson's specimens are redescribed. So far as I know no description of the male of *P. nelumbonis* has been given, altho it has been mentioned in print. If Robertson had specimens of this species it is almost inconceivable that some of the sculptural characters should not have been mentioned, so there is little possibility of the two being the same.

THE ASININUS DIVISION.

The genital characters separating this from the other divisions are based principally on the seventh ventral plate, which is of an entirely distinct form. The wings of this plate as a rule have a broad, more or less quadrate body, invagi-

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nated on the outer margin near base, forming a narrow lobe. At or near the apex of the wing is some form of a membranous flap, (differing in the different species), which usually extends beyond the body. No pubescence is found on the plate except a slight amount on the basal lobe; and there are no tooth-like projections whatever on the outer margin. The eighth ventral plate always has apical lobes, but never the horn-like processes of the Cressoni Division. The genital armatures have no uniform characters to separate them from those of the other groups; but usually they are more slender and delicate than the others.

The face markings of this division are of two types; one in which the lateral marks are very large, and broaden out above the antennal sockets, as in *asininus;* and the other in which the face is broad above, and narrowed suddenly below, causing the lateral marks to diverge suddenly, or at least noticeably, above the level of the antennal sockets, as in *P. wootoni*. The group is not so compact as either of the other two in markings or genitalia. Three species (*nevadensis*, *cookii* n. sp. and *calvus* n. sp.) are included here which are quite different from the rest and from each other, in genitalia, but their relationship is shown without question in other characters. All of the species in this division are comparatively small, and are apparently found only in the Western States, where some become quite abundant.

PROSOPIS ASININUS Ckll. and Csd. 1895.

1895. *P. asininus*, (male), Ckll. and Csd. Tr. Amer. Ent. Soc. 22 : 299.

1895. *P. bipes*. (female), Ckll. and Csd. Tr. Amer. Ent. Soc. 22 : 300.

1896. *P asininus*, Ckll. Psyche Supp. 7 : 30.

1898. *P asininus*. Ckll. Ent., 1898, p. 217.

Male.—Small species; distinguished by its long, narrow face, with long large lateral marks, and by its heavily punctured abdomen.

Length about 5 mm.

Sculpture.—Punctures of front, vertex, and occiput enormous for the size of the insect, confluent, almost pit-like in places, becoming sparse on cheeks. Those of mesoscutum large, rather close, but not confluent; of scutellum similar but a trifle larger and more sparse; metanotum very short, one-third the length of scutellum; with few large,

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round punctures, not rugose. Enclosure of propodeum broad; neck narrow; bowl almost entirely covered with broad, shallow, subquadrate pits; laterad of bowl a rounded, pitted area extends down on the side; remainder of propodeum rugulose. Mesopleura with large, round punctures, separated by less than diameter of one puncture; metapleura rugose striate. Dorsum of abdomen almost uniformly punctured, at least first four segments, with round punctures about half as large as those on mesoscutum; separated by about twice the diameter of one puncture; on sides and venter becoming more sparse.

Yellow Markings.—Supraclypeal mark long; lateral marks confluent with orbit, extending above the insertion of antennæ about the length of scape, and broadening above it; spot on labrum variable. An unbroken line on collar; spots on tubercles, tegulæ, and wing bases yellow. Anterior tibiæ in front; middle and hind tibiæ entirely, except ring near apex, and all tarsi yellow, (fig. 109).

Scape dark, short, broad in front, somewhat flattened (in the figure it is directed upward, appearing abnormally short). Supraclypeal area below insertion of antennæ almost quadrate; clypeus at base slightly narrower than lateral areas at same level.

Genitalia.—Both the armature and the ventral plates are very similar to those of *P. coloradensis* and *P. polifolii*, as shown in the figures, (figs. 23, 55, 67) (see also description under *P. coloradensis*). The membranous flap of each wing of the seventh ventral plate is peculiar in shape, being somewhat ear-like, and finely lined as shown. The location and shape of this distinguishes the species at a glance.

Female.—Larger than the male. About 6 mm. long. In puncturation it is very similar to the male except that the punctures of mesoscutum are more dense, and those of pleura more sparse, while those of the abdomen are much smaller and more sparse. The yellow markings resemble those of the male, except on face and legs. The only marks on the face are two long lateral marks which resemble the lateral marks of the male, except that they do not broaden much above antennal sockets, and are truncate instead of tapering at apex. Base of clypeus almost one and one-half times as broad as lateral areas at same level. Tibiæ with less yellow than those of male, and tarsi except basitarsi black.

Habitat.—So far as known only Arizona and New Mexico. Male and female types from Las Cruces, N. M., "on campus of Agricultural College. Sept. 1894". Recorded on flowers of *Mesquite*, *Solidago*, *Biglovia* and *Fallugia* during May and June.

Six males and three females in the collection represent the above localities. In these there seems to be no variation whatever in general characters. The yellow marking of face and thorax, including the unbroken yellow line on collar, are constant in all. Apparently this is a species showing little

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variation, but not enough material has been obtained to ascertain this with certainty. In both sexes the posterior face of the propodeum is cut squarely off as if with a knife, making a sharp angle above and on sides.

PROSOPIS MEGALOTIS Swk. and Ckll. 1910.

1910. *P. megalotis*, (male and female) Swk. and Ckll. Ent. News. 21:69.

This species is very nearly related to *P. asininus* Ckll. the description of which will apply here except in a few particulars. In the male the external difference is mainly in the larger size, broader face, with heavier, more truncate lateral marks; and in the large amount of yellow on the labrum and mandibles as shown, (fig. 108). The ventral plates of the male, are considerably different from those of *asininus*, however, being like those of *coloradensis* and *polifolii* in lacking the peculiar ear-like flaps. The females of the two species differ in merely secondary characters; the lateral face marks being shorter and the yellow on collar being broken in the center. In both sexes the mesoscutum is more densely punctured, with smaller punctures than in *asininus*, and the propodeum lacks the sharp angle above: the surface being rounded instead of cut off abruptly, (figs. 108, 119).

Habitat.—Nebraska; Colorado; types of both sexes from "Glen, Sioux Co., Neb. Aug. 17, 1906; on *Cleome serrulata* (M. H. Swenk)". In coll. Univ. Neb.

Mr. Swenk records fifty specimens, all but one from Nebraska. Found on *Cleome* and *Solidago*, in August.

This species is a very near relative of *P. asininus* and may prove to be a variety of that when more material is obtained. Two paratypes from Mr. Swenk have been examined, which differ from *asininus* as shown above; in them the distinguishing characters are quite plain, but what will be found in an adequate series cannot be foretold.

PROSOPIS COOKII n. sp.

Male.—Very small; related to *P. asininus* Ckll. but much smaller, with face broader above, lateral marks shorter, and very different genitalia.

Length 3½–4 mm. Slender; posterior face of propodeum cut off

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abruptly, slightly concave, with sharp ridge on lateral and superior borders as in *asininus*. Scape short, stout, but not swollen; posterior side concave, flagellum normal; clypeus long, broad at apex, almost touching eyes, making apices of lateral face marks very narrow and pointed below; face rather broad, narrowed rapidly below.

Sculpture.—Head, thorax, and abdomen heavily punctured. Front, vertex, and occiput with immense, confluent punctures, like those of *asininus*, continuing quite heavy down on to cheeks. Mesoscutum with large, round, deep punctures, smaller than those of front, separated by less than the diameter of one puncture, usually very much less; scutellum similarly but more sparsely punctured; metanotum narrow, roughened. Propodeum similar to that of *asininus* but pits smaller. Mesopleura mainly punctured like mesoscutum, but becoming rugulose dorsad and cephalad; metapleura rugose striate. Abdomen coarsely punctured, first segment similarly to mesoscutum, but punctures slightly smaller and more separated; punctures on remaining segments still smaller, but quite dense.

Yellow Markings.—Face marks clear cut, distinct; supraclypeal mark extending above antennal sockets, longer than broad; lateral marks very narrow at apex of clypeus, filling lateral areas, following outline of antennal sockets, broadening slightly above, then tapering off evenly to tip on eye margin, about two-thirds the length of scape above antennal sockets. Base of clypeus slightly narrower than lateral marks at same level. Yellow on collar broken in center; tubercles, tegulæ, and wing bases with yellow spots. Anterior tibiæ in front, middle and hind tibiæ, except a subapical ring, and all tarsi yellow, (fig. 111).

Genitalia.—Armature similar to that of *P. asininus;* seventh ventral plate without any membranous attachments; each wing being pointed at tip, broadening medially, and lobed at base; lobe short and sparsely pubescent, (fig. 60). Eighth ventral plate similar to that of *P. asininus*, but short and stout, (fig. 68).

Female.—Very small, with dense puncturation similar to that of male, except on abdomen where the punctures are small, fine and close on all but basal segment. Differs from female of *P. cressoni* in puncturation, yellow on collar, and face marks; from female of *P. wootoni* by its very small size, heavy, large punctures, especially on head and pleura, and in the short, narrow lateral face marks, (fig. 116).

Habitat.—Type of male from Filmore Cañyon, Colo., Aug. 27, (Coll. Cockerell). Female from White Mountains, N. M. (Coll. Townsend, in Cockerell Collection).

The unique male type of this species is marked "*P. asininus* var." by Professor Cockerell, but is quite distinct from

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that species; differing as it does in size, proportions of face, and genitalia. In its face it is intermediate between the broad face of *wootoni* and the very narrow one of *asininus*; the lateral marks are intermediate between these two in length, being longer than those of *wootoni*, but not extending so far along eye margin as in *asininus*. The base of the clypeus is considerably narrower than in *wootoni*, and the lateral marks are broader above, and not irregular in outline, (fig. 111). The female can only be confused with that of *P. asininus* or of *wootoni*, and in a series may intergrade with the former. The specimen described is easily recognized by its small size, and yellow markings which are not large and conspicuous on either head or thorax. This and the nearly related females may be separated from those of the small species of the Cressoni Division by the heavy, coarse punctures of the head extending on to occiput, and by the heavier punctures of the thorax.

PROSOPIS COLORADENSIS Ckll. 1896.

1896. *P. coloradensis.* (male), Ckll. Psyche Supp. 7:30.
1906. *P. tuertonis*, (female). Ckll. Bull. Amer. Mus. Nat. Hist. 22:423.
1907. *P. coloradensis*, Ckll. Uni. Colo. Studies. 4:240.

Male.—Small; easily told by its peculiar broad face; short lateral marks and very narrow supraclypeal mark. Antennal sockets very close together; supraclypeal area below antennal sockets much longer than broad.

Length about 5.5 mm. Scape short, dark, punctured, as in *asininus*.

Sculpture.—Front, vertex, and occiput with large, confluent punctures, becoming sparse on cheeks. Mesonotum densely punctured with medium sized punctures, smaller than on head, separated by only about one-half the diameter of one puncture; scutellum similarly but not so densely punctured; metanotum rugose, almost pitted. Enclosure of propodeum normal in shape, entire bowl pitted irregularly; lateral space on each side of enclosure pitted, as in *asininus;* remainder of propodeum rugose. Mesopleura rather heavily punctured, almost confluent cephalad, and becoming striate dorsad; metapleura longitudinally striate. Dorsum of first three or four segments of abdomen distinctly punctured with smaller and more sparse punctures than those of mesoscutum, becoming more sparse ventrad, and almost lacking on apical segments.

Yellow Markings.—The face marks are clear cut, (fig. 107); lateral

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marks exceedingly broad, filling lateral areas but not broadening above insertion of antennæ as in the preceding species, extend about half the length of scape above antennal sockets, uniform in width, ending almost abruptly; clypeus about 2.5 times as broad at apex as at base, and only two-thirds as wide at base as lateral areas at that level; supraclypeal mark long and narrow, not extending above antennal sockets; yellow on collar restricted to a narrow spot on each side. Tegulæ, tubercles and wing bases with more or less yellow. Anterior tibiæ in front, base and apex of middle and hind tibiæ, and all basitarsi yellow; other tarsi brownish.

Genitalia.—Armature rather slender; cardo quite short and broad; stipes with broad superior lobe and slender apex, hairy; sagittal rods normal, (fig. 21). Seventh ventral plate without teeth, largely membranous; wings broad, hairless except for narrow small lobe, (fig. 58). Eighth ventral plate long; basal part normal; distal pedicel rather narrow, ending in two flap-like apical lobes covered with long hair, (fig. 64).

Female.—Larger than male, but puncturation similar in general; occiput almost impunctate, and abdomen usually quite impunctate. Face broad; lateral marks very narrow, short stripes, (fig. 117); thoracic markings small and inconspicuous; legs dark, except base of hind tibiæ.

Habitat.—Rocky Mountain States, and westward; specimens in the collection represent Colo., Wyo., Nev., Calif., Neb., S. D. and N. M. Type locality, Chambers Lake, Colo. 9500 feet. Recorded on *Solidago* and *Cleome*. Nine male, and ten female specimens examined. I have taken this species in the foot-hills of the Big Horn Mts. in Wyoming at about 4000 feet; F. S. Bichowsky has taken it in King's River Cañyon, Calif., at 8000 feet; and Townsend has taken it in the White Mts., N. M. at 6600 feet.

The few specimens at hand show comparatively little variation in the male, except in puncturation of the abdomen; in some specimens the entire dorsum is heavily punctured, while the original description of the male states, "first segment of abdomen minutely but distinctly and rather closely punctured", so evidently that is the typical form. Altitude has apparently no effect on the puncturation for specimens from 4000 and 8000 feet are alike in this respect. Among the female specimens there is considerable variation; the lateral face marks being very irregular in some, but always

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short and narrow. Between the typical females of this and *P. wootoni* there is apparently more or less intergradation, making absolute distinction impossible in some cases; in general, however, separation can be made as stated.

PROSOPIS CALVUS n. sp.

Male.—Small species; nearest to *coloradensis*, but differs in the narrower face, short, narrow, lateral face marks, and entirely different genitalia.

Length about 5 mm.; slender; posterior face of propodeum small, not cut off squarely, but rounded above; scape short, stout, similar to that of *coloradensis;* flagellum normal, light beneath; clypeus long, narrow at base, about two-thirds the width of the lateral areas at same level; surpraclypeal area below antennal sockets longer than broad.

Sculpture.—Head, thorax, and abdomen heavily punctured with large punctures, becoming faint on cheeks. Mesoscutum heavily punctured with medium sized punctures, considerably smaller than on front, separated by less than the diameter of one puncture; scutellum with much larger, more sparse punctures; metanotum over half as long as scutellum, rugulose. Enclosure of propodeum broad above; neck narrow; entire bowl shallowly pitted; small areas laterad of bowl also pitted; lateral areas of posterior face punctured; sides rugulose. Mesopleura more sparsely punctured than mesoscutum, but punctures of same size; metapleura striate. First two segments of abdomen heavily punctured, with medium sized, round punctures, separated by about the diameter of one puncture; remaining segments very sparsely punctured.

Yellow Markings.—Face marks extending very little above antennal sockets, (fig. 110); supraclypeal mark not extending between antennal sockets; lateral marks broad, short, filling lateral areas, but ending almost abruptly at upper level of sockets. Collar with a small yellow spot on each side; tubercles with yellow spots; other thoracic marks lacking. Legs with anterior tibiæ in front, basal third of middle and hind tibiæ, and basitarsi yellow; other tarsi brown.

Genitalia.—Armature short, stout; stipes heavy, with large superior lobe, and stout, rounded, heavily haired apical portion; sagittæ extending beyond stipites; volsella very large, lateral lobes almost round, inner lobes very small, (fig. 20). Seventh ventral plate entirely nude; wings largely membranous, long, narrow; each with a large transparent flap on outer side; chitinous portion of proximal arms unite before they reach the extension of the wings, in a broad curve, instead of close to the wings as in other species, (fig. 59). Eighth ventral plate short, stout, hairless; distal pedicel short, stout, ending in two long, narrow divergent lobes, without pubescence, (fig. 63).

Female.—Unknown.

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Habitat.—Santa Clara County, Calif. (coll. C. F. Baker). Type locality only one known for the species.

This is a peculiar species in many respects; resembling in face marks the males of *P. coloradensis*, but face much less broadened, and lateral marks not extending up along eye margin above insertion of antennæ, and not so broad. The upper portions of the marks are not clear cut and in a series will probably prove somewhat variable, altho in the specimens known they are alike. Similarly the thoracic markings, not being conspicuous, will probably be variable. In characters of the male genitalia this species shows no close relationship to any others; the armature in the broad superior lobe of the stipes resembles *P. cressoni*, but is otherwise quite different; in ventral plates it stands alone in having these completely nude, altho the general shape of the seventh ventral plate is quite like that of *P. cressoni*, but without any tooth-like projections. The eighth ventral plate differs strikingly from all others in the form and position of the apical lobes. Owing to the delicate membranes of the seventh ventral plate its exact structure is difficult to determine, and the accompanying figure may be somewhat incorrect in details, but the general form and appearance is unmistakable

PROSOPIS WOOTONI Ckll. 1896.

1896. *P. wootoni*, Ckll. Psyche Supp. 7:26.
1896. *P. divergens*, Ckll. Pysche Supp. 7:29.
1898. *P. wootoni*, Ckll. Ent., 1898, p. 217.
1901. *P. divergens*, Lov. Ent. News. 12:8.
1903. *P. clandestinus*, Vier. Insects, Beulah, N. M.
1904. *P. divergens*, Vier. Can. Ent. 36:93.
1906. *P. divergens*, Ckll. Bull. Amer. Mus. Nat. Hist. 22:423.
1910. *P. excavata*, (female), Swk. and Ckll. Ent. News. 21:70.

Male.—Small; distinguished by short, tapering lateral marks; and broad base of clypeus, which is about the same width as lateral marks at that level.

Length about 5 mm. Scape short, heavy, entirely dark, flattened, slightly concave behind.

Sculpture.—Front, vertex and occiput densely, confluently punctured; punctures as in *asininus* but not so pit-like. Punctures of thorax similar in general to that of *P. coloradensis*, but pleura quite sparsely punctured and pits of propodeum small, resembling rugæ.

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Posterior face of propodeum quite small; borders rounded, without raised ridge. Punctures of abdomen usually sparse; first segment finely, sparsely punctured; the punctures small and separated by about six times the diameter of one puncture; remaining segments practically impunctate.

Yellow Markings.—Lateral marks short, not reaching more than about one-third the length of scape above antennal sockets, but narrow (much more so than in *coloradensis*), and tapering to a point; supraclypeal mark usually broader than long, (figs. 112–113). Except for dark tegulæ and wing bases the markings of the thorax are the same as in *P. coloradensis*. Legs with front of fore tibiæ, basal third of middle and hind tibiæ, and basal portion of tarsi yellow.

Genitalia.—Resemble those of *coloradensis* but are much smaller, apices of stipites rounded and heavy, instead of tapering; basal lobes less pronounced. Seventh ventral plate does not differ from that of *P. coloradensis* except in size, (Fig. 56). Eighth ventral plate differs only in being smaller and somewhat stouter, (fig. 66).

Female.—Resembles the male in size and puncturation. Abdomen finely but usually closely punctured; occiput usually almost impunctate. Lateral face marks fill lateral areas below base of clypeus, from which they slant off gradually above to tip somewhat above antennal sockets, (fig. 118). Legs black, except spots at base of tibiæ; thoracic markings as in male.

Habitat.—Rocky Mountain States. Type locality, "Ruidoso Creek, N. M., 7000 feet, taken on *Scrophularia*, July. (E. O. Wooton)".

Specimens examined: 68, representing N. M., Ariz., Colo., Wyo., Nev., Ore. Taken at altitudes ranging from 4000 to 8000 feet, from June to August.

This is a very variable species in both sexes. The abdominal puncturation varies from that of the typical form with only the first segment distinctly punctured, to others with almost the entire dorsum punctured. A series of forty specimens from Ormsby County, Nev. collected by C. F. Baker almost all have yellow on the tegulæ in both sexes, and have heavily punctured abdomens. In some the lateral face marks are broader above the antennæ than in the typical form, and end almost abruptly (fig. 113), but between this and the typical form are all variations. Seven specimens from Sheridan, Wyo. are about midway between the two above forms in puncturation, and markings. They have just

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moderate puncturation on the abdomen; are larger than the new Mexican specimens but smaller than the Nevada specimens, and have yellow on the tegulæ. A male from Oregon has a very small supraclypeal mark, poorly formed lateral marks, and very heavily punctured abdomen. One from Colorado has very well formed, complete face marks like the Nevada specimens, but sparsely punctured abdomen. A male from Canada has very poorly developed face marks, dark tegulæ, and a very sparsely punctured abdomen. In all of these the variation is so irregular that no line can be drawn separating even varieties.

The description of *P. clandestinus* Vier. corresponds almost exactly to that of the New Mexican specimens of *P. wootoni* in the collection, there being no characters which could in any way distinguish the two. Viereck's specimens were from the same locality as these and I have no doubt that they are identical. At least they will have to be considered so until further characters are given.

P. divergens Ckll. is described as differing from *P. wootoni*, "by its smaller size, white face, and spots on tegulæ", but cannot be distinguished by these characters. I have specimens of this from Colo. and N. M. determined by Cockerell, as well as the Baker collection from which it was described, and all are indistinguishable in external or genital characters from *wootoni*.

P. excavata Swk. and Ckll. is only one of the series of variable female specimens in this species; the slight excavation in the face marks is merely an incidental variation in pigmentation, often found in several species. I have examined the type of this and compared it with the series mentioned above, in which it is indistinguishable, (fig. 120).

PROSOPIS POLIFOLII Ckll. 1901.

1901. *P. polifolii*, Ckll. Can. Ent. 33: 281.
1905. *P. polifolii*, Ckll. Psyche. 10:74.
1910. *P. polifolii*, Ckll. Ann. and Mag. Nat. Hist. Ser. VIII, 5:29.

Male.—Small; most easily distinguished by absence of supraclypeal mark, and by long lateral face marks. In general features it is quite similar to *P. wootoni*.

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Sculpture.—Head, thorax and abdomen very heavily, densely punctured. Front, vertex, and occiput heavily, confluently punctured; punctures running into striæ on cheeks. Mesoscutum entirely covered with crowded, almost confluent punctures, somewhat smaller than those of head; scutellum densely punctured with somewhat larger punctures; metanotum about half as long as scutellum, rugose. Enclosure of propodeum normal, clearly defined, irregularly pitted on superior face; remainder finely rugulose; rest of propodeum ranging from coarsely rugulose laterad of bowl of enclosure to finely rugulose on lateral areas of posterior face. Mesopleura punctured similarly, and almost as densely as mesoscutum; metapleura rugose, not conspicuously striate. Dorsum of first three abdominal segments heavily punctured with round, clear cut punctures about the size of those on mesoscutum, separated by about one-fourth the diameter of one puncture; remaining segments distinctly, but more lightly punctured.

Yellow Markings.—Face marks only on clypeus and lateral areas, the supraclypeal area being dark; clypeal mark broader at base than lateral marks at that level; lateral marks long, not following outline of antennal sockets, but slanting off from slightly above base of clypeus, gradually narrowing to truncate tips at about one-third the length of scape above the sockets. Stripe on each side of collar, tubercles, and often tegulæ and wing bases yellow. Front of fore tibiæ, basal third of middle and hind tibiæ, and basitarsi yellow, (figs. 112, 113).

Genitalia.—Armature indistinguishable from that of *P. asininus* or *P. wootoni*. Seventh ventral plate differs from that of the other two only by the long, narrow basal lobe, (fig. 57). Eighth ventral plate differs from that of *coloradensis* only in its smaller size, (fig. 65).

Female.—Indistinguishable from that of *P. wootoni* (fig., 122).

Habitat.—California. Especially common in Southern California, being by far the most common species in this region.

Specimens examined: About 150.

This species is very nearly related to *P. wootoni*, being perhaps only a variety of that. The lateral face marks of the male vary considerably in a series: sometimes the lateral marks fill all the space in the lateral areas, but usually they are more poorly developed than in the specimen figured. Often there is considerable dark space between the lateral marks and the clypeal mark, in which case the upper extensions of the lateral marks are usually pointed and narrow. In some specimens the lower and lateral portions of the clypeus are dark. In no specimens is there any yellow on the supra-

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clypeal area. The tegulæ may or may not have yellow. The affinity of this species is undoubtedly with *P. wootoni*, from which it is only distinguished by the dark supraclypeus and the long basal lobes of the seventh ventral plate. Apparently, however, these characters are constant in all specimens. The variations in the markings of the female are not as noticeable as in the male, but in this as in the other sex the lateral marks are always long. Occasionally a specimen is found with a yellow spot on the clypeus, but never very conspicuous. This sex can only be separated from *P. wootoni* females by locality, which is not at all certain.

PROSOPIS NEVADENSIS Ckll. 1896.

1896. *P. nevadensis*, Ckll. Psyche Supp. 7:32.
1898. *P. nevadensis*, Ckll. Ent., 1898, p, 185.
1910. *P. hesperiphila*, Ckll. Ann. and Mag. Nat. Hist. Ser. VIII. 5:29.

Male.—Small; very similar to *P. polifolii* Ckll., but can be distinguished by its broader face, short broad lateral face marks, and very different genitalia.

About 5 mm. long. Face broad above, narrowing suddenly below; clypeus narrower at base than lateral areas at same level, and about twice as broad at apex as at base. Antennæ and general structure as in *polifolii*.

Sculpture. Punctures of head, thorax, and abdomen dense and heavy as in *polifolii*.

Yellow Markings.—Lateral face marks broad, filling lateral areas, following antennal sockets for about one-fourth their circumference; truncate at about the level of top of antennal sockets, with a slight projection at eye margin, (fig. 115). Collar, tubercles, tegulæ, and wing bases normally with yellow.

Genitalia.—Armature short, stout; cardo rather short; stipes stout; superior lobe extending half-way to apex; apical portion stout, tapering at tip, rather heavily haired; volsella large, especially lateral lobe; sagittal rods equal in length to stipites, (fig. 22). Seventh ventral plate unlike that of any other species. Each wing is rather long, uniform in width thruout, curving out gradually at base where it is rounded, without any basal lobe; basal portion sparsely covered with rather long delicate hairs; apex of each wing a membranous flap extending outward or forward, (fig. 61). Eighth ventral plate short, stout; distal pedicel stout, ending in two apical lobes, pubescent at tips, (fig. 62).

Female.—Similar to same sex of *P. polifolii*, but has short lateral face marks, (fig. 121).

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Habitat.—So far as known, Nevada and California. California specimens taken in King's River Cañyon at 7000–8000 feet (F. S. Bichowsky).

Specimens examined: About 20.

This species is peculiar in being evidently so nearly related to *P. polifolii* and yet having such different male genitalia. In some of the males are found traces of a supraclypeal mark as small yellow blotches. As in *polifolii* there is often more or less black between the lateral and clypeal marks, and also at apex of clypeus. The membranous flaps of the seventh ventral plate do not always point out as shown in the figure, but may point somewhat forward, giving a narrowed appearance to the wings. All the males examined are readily separated from those of *P. polifolii* by the short lateral face marks, and the two females from King's River are separated in the same way, but whether this will serve in a large series from many localities is doubtful. The real diagnostic characters are in the male genitalia which can be told at a glance. No previous description of the female has been given, to my knowledge.

P. hesperiphila Ckll. described in 1910 from California specimens is undoubtedly this species, if the description is characteristic. It was based upon the characters of the lateral face marks, which are, "truncate above, and strongly notched by antennal sockets". I have examined the type of this and cannot distinguish it from California specimens of *nevadensis*.

UNCERTAIN SPECIES.

Prosopis affinis Sm. 1853.

1853. *P. affinis*, Sm. Cat. Hym. Brit. Mus. 1:24.
1910. *P. affinis*, (female), Lov. Psyche. 17:179.

No one has yet been able to definitely identify specimens in America as belonging to this species. That usually taken for it has been *P. ziziæ* Rob., but Lovell has shown this to be erroneous in his recent description of the type, (Psyche. 17:179). He considered the two sexes described as *affinis* to belong to different species, and calls that of the male "*P. binghami* n. sp.". From the description and figures given,

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however, I can see no reason for this separation, as there are no characters to indicate a radical difference; in fact both sexes so strongly resemble *P. modestus* that it is quite probable they are this species. At least they cannot be definitety determined without an examination of the male genitalia.

Prosopis confluens Sm. 1853.
1853. *P. confluens*, (female), Sm. Cat. Hym. Brit. Mus. 1:24.

Only a very brief general description is given of the female of this species, from which it is unrecognizable.

Prosopis suffusa Ckll. 1896.
1896. *P. suffusa*, (male), Ckll. Psyche Supp. 7:32.

From the description this is evidently one of the "Asininus Division", probably *P. wootoni*, or very nearly related to it.

Prosopis georgica Ckll. 1896.
1896. *P. georgica*, (male), Ckll. Psyche. 7:438.

This is characterized by its, "small size, converging orbits, yellow face, and largely yellow scape". The lateral marks terminate, "broadly on orbital margin"; abdomen impunctate. I have been unable to recognize this.

Prosopis rugosulus Ckll. 1896.
1896. *P. rugosulus*, (male), Ckll. Psyche Supp. 7:28.

The punctured abdomen of this species would indicate a relationship with *episcopalis*, as would also the face marks with, "lateral extensions—ending, about on level with middle of scape in a broad truncation". I have the lot from which this was described, but can find only *episcopalis* in it. Dr. Howard writes that this species is known in the National Museum only by its unique type, and I know of no other specimen.

Prosopis verticalis Cr. 1869.
1869. *P. verticalis*, (male), Cr. Proc. Bos. Soc. Nat. Hist. 12:271.
1909. *P. verticalis*, (female), Lov. Ent. News. 20;413.
1910. *P. verticalis*, Lov. Psyche. 17:184.

Apparently this is related to *P. rudbeckiæ*, and may be the same species. "The stripe on each side of face curves inwardly just above the insertion of antennæ, and ends in a

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smooth, polished, rounded space—not seen in any other species". The description is too indefinite to make accurate determination possible, and I have never examined any authentic specimens, so cannot locate it, altho I presume it belongs in the "Cressoni Division."

Prosopis nelumbonis Rob. 1890.
1890. *P. nelumbonis*, (female), Rob. Tr. Amer. Ent., Soc. 17:318.
1904. *P. nelumbonis*, Rob. Can. Ent. 36:273.

The very brief description of the female differs from that of *P. modestus* in giving, "head and thorax coarsely punctured with coarse, shallow punctures—abdomen with first and base of second segments rufous". It cannot be definitely distinguished by these characters alone. The male has been referred to as also having the basal segment of the abdomen rufous, but to my knowledge it has never been described.

Prosopis nucleolus Vier.
P. nucleolus, (female), Vier. Insects of Beulah, N. M. p. 64.

I have been unable to identify this from the description of the female. It cannot be recognized until the male is described.

Prosopis schwarzii Ckll. 1896.
1896. *P. schwarzii*, (female), Ckll. Ent. Mag. 32:218.
1898. *P. schwarzii*, (male), Ckll. Ent. 1898, p. 216.

This is apparently a distinct species, being large, with coarse thoracic puncturation; and lacking the supraclypeal mark in the male. A male specimen in Professor Cockerell's collection lacks the supraclypeal mark, has only a yellow blotch on clypeus, and has short lateral marks, confluent with the orbit. It is evidently of the "Modestus Division", but cannot be located with certainty until the male genitalia are examined.

Prosopis thaspii Rob. 1898.
1898. *P. thaspii*, Rob. Tr. Ac. Sc. St. Louis. 8:43.
1904. *P. thaspii*, Rob. Can. Ent. 36:273.

Both sexes of this species are characterized by having a lateral tooth on front coxa, according to the description.

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Otherwise there is nothing to distinguish it from other species. I have never seen a specimen of Prosopis with this character.

Prosopis telepora Lov. 1911.

1911. *P. telepora*, (female and male) Lov. Ent. News. 22:213.

The description of this species would indicate that it is very closely allied to *P. cressoni*, if not that species. The characters given correspond to those of the form of *cressoni* having very narrow upper processes of lateral face marks.

Prosopis melitina Lov. 1911.

1911. *P. melitina*, (female) Lov. Ent. News. 22:214.

The description is of the female only, and might indicate any of several species. Evidently a large species, similar to *P. varifrons* or *P. episcopalis* var. *subtristis*.

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EXPLANATION OF PLATES.

All figures are drawn to scale with the camera lucida. The face drawings are all enlarged the same amount, to show relative sizes, and proportions. Likewise the genitalia figures have all received equal magnification.

In comparing the facial figures account must be taken of the angle at which the head is placed, and the direction of the antennæ. In some the face is tipped slightly forward or backward, as shown by the eyes and antennal sockets; this tends to shorten the clypeus somewhat. Similarly the scape may be slanted upward, or even somewhat downward, and consequently changed a little in proportions; this can be distinguished by the apical margin, which is concave if high and convex if low. An apparent discrepancy is also noticeable in some cases where the broad surface of the scape is in view in one drawing and the narrow surface in another. In general, however, when the position is not normal the fact is evident from the figure, or attention is called to it in the text.

In the figures of genitalia the sagittæ often appear distorted, owing to their extreme delicacy as mentioned before, and apparent differences will be seen where none exist, so these cannot be relied upon. Similarly the stipites in some figures diverge noticeably, but this is merely due to the individual mount and not characteristic. Darkened areas in the eighth ventral plate vary considerably with the amount of clearing which the specimens have undergone, and are of no importance, except in such cases as are noted in the text.

PLATE II.

11. *P. ziziæ*. Genital armature.
12. *P. modestus*. Genital armature.
13. *P. episcopalis*. Genital armature.
14. *P. fossata*. Genital armature.
15. *P. conspicua*. Genital armature.
16. *P. rudbeckiæ*. Genital armature
17. *P. varifrons*. Genital armature.
18. *P. tridentulus*. Genital armature.
19. *P. grossicornis*. Genital armature.
20. *P. calvus*. Genital armature.

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21. *P. coloradensis*. Genital armature.
22. *P. nevadensis*. Genital armature.
23. *P. asininus*. Genital armature.
24. *P. wootoni*. Genital armature.

PLATE III.

25. *P. modestus*. Eighth ventral plate.
26. *P. ziziæ*. Eighth ventral plate.
27. *P. episcopalis*. Eighth ventral plate.
28. *P. fossata*. Eighth ventral plate.
29. *P. ziziæ*. Seventh ventral plate.
30. *P. ziziæ* var. *dunningi*. Seventh ventral plate.
31. *P. potens*. Seventh ventral plate.
32. *P. basalis*. Genital armature.
33. *P. potens*. Eighth ventral plate.
34. *P. basalis*. Eighth ventral plate.
35. *P. potens*. Genital armature.
36. *P. basalis*. Seventh ventral plate.

PLATE IV.

37. *P. rudbeckiæ*. Seventh ventral plate.
38. *P. cressoni*. Seventh ventral plate.
39. *P, cressoni*. form *saniculæ*. Seventh ventral plate.
40. *P. rudbeckiæ* var. *bakeri*. Seventh ventral plate.
41. *P. varifrons*. Seventh ventral plate.
42. *P. grossicornis*. Seventh ventral plate.
43. *P. tridentulus*. Seventh ventral plate.
44. *P. conspicua*. Seventh ventral plate.
45. *P. varifrons*. Eighth ventral plate.
46. *P. tridentulus*. Eighth ventral plate.
47. *P. tridentulus*. Eighth ventral plate (lateral view).
48. *P. grossicornis*. Eighth ventral plate.
49. *P. conspicua*. Eighth ventral plate.
50. *P. rudbeckiæ*. Eighth ventral plate.
51. *P. cressoni* form *saniculæ*. Eighth ventral plate.
52. *P. cressoni*. Eighth ventral plate.
53. *P. cressoni*. Eighth ventral plate.
54. *P. rudbeckiæ* var. *granulatus*. Eighth ventral plate.

PLATE V.

55. *P. asininus*. Seventh ventral plate.
56. *P. wootoni*. Seventh ventral plate.
57. *P. polifolii*. Seventh ventral plate.
58. *P. coloradensis*. Seventh ventral plate.
59. *P. calvus*. Seventh ventral plate.
60. *P. cookii*. Seventh ventral plate.

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61. *P. nevadensis.* Seventh ventral plate.
62. *P. nevadensis.* Eighth ventral plate.
63. *P. calvus.* Eighth ventral plate.
64. *P. coloradensis.* Eighth ventral plate.
65. *P. polifolii.* Eighth ventral plate.
66. *P wootoni.* Eighth ventral plate.
67. *P. asininus.* Eighth ventral plate.
68. *P. cookii.* Eighth ventral plate.
69. *P. modestus.* Seventh ventral plate.
70. *P. modestus.* Seventh ventral plate.
71. *P. fossata.* Seventh ventral plate.
72. *P. modestus.* Seventh ventral plate.
73. *P. episcopalis.* Seventh ventral plate.
74. *P. episcopalis.* Seventh ventral plate.
75. *P. episcopalis* var. *coquillettii.* Seventh ventral plate.
76. *P. episcopalis.* Seventh ventral plate.

PLATE VI.

Face drawings of males.

77. *P. cressoni* var. *magniclavis* (paratype of *P. magniclavis*).
78. *P. cressoni.*
79. *P. cressoni.*
80. *P. cressoni* form *mesillæ.*
81. *P. cressoni.*
82. *P. cressoni.*
83. *P. cressoni* form *saniculæ.*
84. *P. grossicornis.*
85. *P. varifrons.*
86. *P. tridentulus.*
87. *P. grossicornis* (type).
88. *P. rudbeckiæ* var. *granulatus.*
89. *P. rudbeckiæ.*
90. *P. rudbeckiæ.*
91. *P. conspicua.*
92. *P. basalis.*

PLATE VII.

Face drawings of males.

93. *P. modestus.*
94. *P. modestus.*
95. *P. modestus.*
96. *P. modestus* var. *illinoiensis.*
97. *P. modestus.*
98. *P. modestus.*
99. *P. modestus.*
100. *P. modestus* var. *minyra.*
101. *P. ziziæ.*

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102. *P. ziziæ* var. *dunningi.*
103. *P. episcopalis.*
104. *P. episcopalis* var. *coquillettii.*
105. *P. fossata.*
106. *P. potens.*

PLATE VIII.

Face drawings.
107. *P. coloradensis.* Male.
108. *P. megalotis.* Male
109. *P. asininus.* Male.
110. *P. calvus.* Male.
111. *P. cookii.* Male.
112. *P. wootoni.* Male.
113. *P. wootoni.* Male.
114. *P. polifolii.* Male.
115. *P. nevadensis.* Male.
116. *P. cookii.* Female.
117. *P. coloradensis,* Female.
118. *P. wootoni.* Female.
119. *P. megalotis.* Female (paratype).
120. *P. wootoni.* Female (type of *P. excavata*).
121. *P. nevadensis.* Female.
122. *P. polifolii.* Female.
123. *P. wootoni.* Female.

PLATE IX.

Face drawings, female.
124. *P. cressoni.*
125. *P. cressoni* form *mesillæ.*
126. *P. cressoni.*
127. *P. cressoni.*
128. *P. cressoni.*
129. *P. cressoni.*
130. *P. varifrons.*
131. *P. basalis.*
132. *P. episcopalis* var. *subtristis* (paratype of *P. subtristis*).
133. *P. fossata.*
134. *P. cressoni* var. *magniclavis* (paratype of *P. magniclavis*).
135. *P. conspicua.*
136. *P. modestus.*
137. *P. rudbeckiæ.*
138. *P. ziziæ.*
139. *P. episcopalis* var. *coquillettii.*

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NEW NORTH AMERICAN BOMBIDÆ.

BY H. J. FRANKLIN, PH.D.
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The author has, for several years, had in process of preparation a monograph of the Bumble-Bees, (*Bombus*) and the Inquiline Bees (*Psithyrus*) of the entire New World, and it was his expectation to have published this work this spring. The pressure of other work, however, makes it necessary to put off this publication, for a few months, though the paper is near completion.

Under the circumstances, it seems best to publish, in a short advance paper, the descriptions of the following species: these species being the more important of the new North American forms, which have been discovered in the course of these investigations.

Bombus (Bombus) fernaldi new name,

Bombus ewardsii Fowler, Rept. Cal. Agr'l Exp. Sta. 1902, Part II, p. 317 (misidentification).

The specimens from which Fowler made his description of this species, having mistaken it for *edwardsii*, may be looked upon as the type specimens. Can those specimens be identified with certainty?

Pile of medium length and rather fine. Face and occiput with much yellow pile; thorax, except for a usually broad black interalar band, clothed with yellow pile; dorsum of abdomen with basal segment yellow, segments two and three usually entirely black, four and five largely yellow and the apex usually black. Corbicular fringes of females dark.

Queen.—Head.—Wide for its length. Face mostly covered for some distance above and below the bases of the antennæ with a patch of pure yellow pile; occiput with a median triangular patch of yellow pile with a slight admixture of black hairs; cheeks dark. Labrum with tubercle-like areas having their posterior (proximal) margins rounded and their summits flat or concaved, the region between them and above the shelf-like projection rather deeply excavated; the shelf-like projection not prominent. Malar space fully as long as its width at apex; between one-fifth and one-fourth as long as the eye. Clypeus

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sparsely and coarsely punctate over the disc; the corners densely and coarsely punctate. Flagellum of antennæ about twice as long as the scape; the third antennal segment much longer than the fifth, the fourth and fifth subequal in length.

Thorax.—Anterior part of the dorsum covered with yellow pile, often with a very slight sprinkling of black hairs admixed; a very broad and well defined black band present between the bases of the wings, its hind border straight or curved backward slightly in the middle; center of the disc naked; scutellum covered with yellow pile, mesopleuræ yellow to the bases of the legs; metapleuræ clothed with yellow pile; sides of the median segment usually with dark and yellow pile mixed.

Abdomen.—Dorsum: segment one yellow; segments two and three black; segment four yellow, but often with some black hairs in the very middle; segment five with considerable black pile in the middle, this very often sprinkling out somewhat strongly through the yellow pile on the sides; segment six dark. Venter largely dark, but with the sides of the apical margins of the second to the fifth segments inclusive fringed more or less heavily with yellow hairs; the middle portion of the apical margin of the first segment also often with a yellow fringe. Hypopygium without a median carina.

Wings.—Somewhat stained with brown; the fore pair darkest along the costal border.

Legs.—Fore and middle coxæ mostly dark; hind coxæ with some yellow hairs on ther outer sides; fore trochanters mostly dark; middle and hind trochanters with considerable yellow pile on their lower sides; fore femora sometimes with a few yellow hairs on their lower sides; middle femora sometimes entirely dark and sometimes with considerable yellow pile on their lower sides; hind femora always with more or less yellow hair, and sometimes with more yellow than black; fore and middle tibiæ and corbicular fringes dark.

Worker.—Much like the queen, but often with a strong admixture of black hairs with the yellow on the front part of the dorsum of the thorax; middle trochanters and hind femora occasionally entirely dark and the hind trochanters sometimes with only a very little yellow pile; the metapleuræ sometimes with considerable dark pile and the sides of the median segment occasionally entirely dark.

Male.—Face and occiput largely covered with pure yellow pile; cheeks with much yellow pile, usually connected with the yellow on the occiput. Malar space longer than its width at the apex; nearly one-fourth as long as the eye. Clypeus mostly covered up with yellow pile. Flagellum of antennæ nearly three and one-third times as long as the scape; third antennal segment somewhat shorter than the fifth; the fourth shorter than the third.

Thorax.—Coloration much like that of the queen and worker, but the black interalar band usually distinctly narrower.

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Abdomen.—Dorsum: segment one yellow; segment two usually mostly black, but its basal middle usually with more or less yellow pile, this pile sometimes extending to the hind margin of the segment; segment three black; segment four yellow, but usually with a little black pile in the very middle; segment five like segment four, but usually with more black pile in the middle; segments six and seven black. Venter, except at the base, clothed mostly with yellow pile.

Wings.—Much like those of the queen and worker.

Legs.—Coxæ, trochanters and femora with much yellow hair; fore and middle tibiæ mostly dark; hind tibiæ with outer faces slightly hairy, their fringes usually with more or less pale ferruginous hairs; hind metatarsi with long, pale ferruginous hind fringes.

Dimensions.—Length: queen, 13½ mm. to 15 mm.; worker, 10 mm. to 12 mm.; male, 10 mm. to 12 mm. Spread of wings: queen, about 34 mm.; worker, 22 mm. to 31 mm.; male, 22 mm. to 27 mm. Width of abdomen at second segment: queen, about 9 mm.; worker, 6 mm. to 8 mm.; male, 4½ mm. to 7 mm.

Redescribed from three queens, seventeen workers and seven males.

Habitat.—Most of my records for this species are Californian, as follows: Santa Clara County, Lake County, Nevada County, San Jose County, Mendocino, Sonoma County, Palo Alto, Yosemite. I have seen one worker from Nevada. It seems to be a common species in California, at least in some localities.

The species is a rather pretty one, the yellow pile being very bright and contrasting sharply with the black.

I take pleasure in naming this species for Prof. C. H. Fernald.

Bombus (Bombus) ambiguus new species.

Types.—Described from one queen (the type) deposited in the collection of Leland Stanford Jr. University and six workers (cotypes) distributed evenly in the collections of the American Entomological Society, the Massachusetts Agricultural College and Leland Stanford Jr. University.

Pile of medium length and rather coarse in texture. Face and occiput with considerable yellow pile. Dorsum of thorax with mixed black and yellow pile in front and mostly dark between the bases of the wings and on the scutellum; mesopleuræ yellow; dorsum of abdomen yellow at base, black in the middle and black or slightly ferruginous at apex; wings rather strongly stained with brown. Malar space long.

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Queen.—Head.—Face and occiput with large patches of pure yellow pile; cheeks mostly dark, but with a little yellow hair on the ventro-lateral portions. Labrum with tubercle-like areas large and not greatly separated, their margins rounded and summits only moderately concave, almost flat; the shelf-like projection narrow and not very prominent. Malar space distinctly longer than its width at apex; fully one-fourth as long as the eye. Clypeus sparsely and delicately punctate over the disc, almost smooth; the corners coarsely punctate. Third antennal segment much longer than the fifth, the fifth longer than the fourth.

Thorax.—Anterior part of dorsum covered with a mixture of black and yellow pile, the region between the bases of the wings entirely black and the scutellum mostly black, but with a slight sprinkling of yellow hairs on its hind margin; center of disc naked, smooth and shining; a line of dark pile running forward from the tegula on each side; mesopleuræ entirely covered with yellow pile to the bases of the legs; metapleuræ mostly yellow, but partly dark; sides of median segment dark.

Abdomen.—Dorsum: segment one well covered with yellow pile on the sides, but rather sparsely clothed and with a few dark hairs in the middle; segment two for the most part well covered with yellow pile, but less densely clothed and with a few black hairs on the basal middle; segments three and four entirely black; segment five black at base, but with light ferruginous pile on the apical portion, especially in the middle; segment six mostly ferruginous, but with some black hairs on the sides. Venter with the apical margins of all the segments, except the basal and apical one, well fringed with light yellow hair.

Wings.—Somewhat strongly stained with brown; the fore pair much the lightest across their middle portions.

Legs.—Trochanters with considerable light pile on their lower sides and the corbicular fringes with some ferruginous hairs (as seen with a lens), otherwise mostly dark; the tarsi rather strongly ferruginous.

Worker.—Much like the queen, but the occiput always and the face sometimes with a strong admixture of black hairs with the yellow; the thorax usually with a somewhat stronger sprinkling of yellow hairs on the hind margin of the scutellum than in the case of the queen; sometimes with no line of dark pile running forward from the tegula; metapleuræ sometimes mostly dark, and sometimes mostly yellow; sides of median segment usually with a sprinkling of yellow hairs; first dorsal abdominal segment yellow only on the sides, dark and sparsely clothed in the middle; second dorsal segment sometimes as in queen, but usually with a noticeable median triangle of black pile, the base of the trangle being on the front margin and its apex reaching backward across the hind margin; the dorsum of the abdo-

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men as a whole usually with but little light pile and sometimes entirely dark beyond the second segment; corbicular fringes usually entirely dark; trochanters sometimes with very little light pile; venter sometimes with very little light hair on the apical margins of any of the segments.

Male.—Unknown.

Dimensions.—Length: queen, 12 mm.; worker, 9 mm. to 13 mm. Spread of wings: queen, 30 mm.; worker, 21 mm. to 25 mm. Width of abdomen at second segment: queen, 8 mm.; worker, 5 mm. to 6 mm.

Habitat.—My records for this species are only those of the type specimens, as follows: California (one queen without locality label, three workers from Sisson and one worker from Santa Cruz Mts.) and Washington (two workers from Keyport). It appears to be a rare species, confined to the Pacific coast region of the western United States. What are its northern, eastern and southern limits?

This form is most closely related to *B. sitkensis* Nyl. of which it may be only a subspecies, though all the specimens before me have noticeably shorter pile than has that species.

Bombus (Bombias) mormonorum new species.

Types.—Described from four queens (cotypes), many workers (all cotypes) and two males (cotypes). These specimens were all taken in Utah as follows: two queens, nineteen workers and two males from Beaver Valley (the contents of a nest); one other queen and one other worker also from Beaver Valley; one queen and one worker from Beaver Creek Hills; one worker from Beaver Canyon and two from South Creek, Beaver County. All the type specimens deposited in the collection of the Museum of Brooklyn Institute except a queen and worker in the collection of the Massachusetts Agricultural College and a queen and worker in the collection of the United States National Museum.

Pile short and of medium texture. Thorax clothed with yellow pile, with no trace of a black interalar band. Dorsum of abdomen with segment one yellow; segment two entirely yellow or with the apical margin black or the basal middle tawny; the remaining segments mostly black. Corbicular fringes of females dark. Wings of females rather deep brown. Malar space short.

Queen.—Head.—Face with considerable yellow pile mixed with the

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black about the bases of the antennæ; occiput with considerable yellow pile, but usually with more of less black hair admixed; cheeks dark. Labrum with tubercle-like areas having their hind (proximal) margins rather sharply rounded and summits considerably concaved, the region between them, and above the shelf-like projection, deeply excavated; the shelf-like projection rather wide and prominent. Malar space distinctly shorter than its width at the apex; less than one-sixth as long as the eye. Clypeus for the most part very delicately punctate over the disc. Each lateral ocellus about one-half as far from the supra-orbital line as from the nearest eye. Flagellum of antennæ about one and four-fifths times as long as the scape; third antennal segment longer than the fifth, the fifth longer than the fourth.

Thorax.—Dorsum clothed with yellow pile; mesopleuræ covered with yellow pile to the bases of the legs; metapleuræ mostly clothed with yellow; sides of the median segment sometimes entirely dark and sometimes clothed with light yellow pile, but usually with a mixture of dark and light hairs.

Abdomen.—Dorsum: segment one yellow; segment two covered with yellow pile, except for black on its apical margin; segment three black, but sometimes with slight touches of yellow pile on the extreme side margins; segments four, five and six entirely black. Venter black. Hypopygium without a median carina.

Wings.—Rather dark brown; the fore pair darkest in the region beyond the veins.

Legs.—Coxæ and trochanters mostly dark; femora with more or less yellow pile on their lower sides; fore and middle tibiæ and corbicular fringes dark.

Worker.—Much like the queen, but the apical margin of the second dorsal abdominal segment often covered with yellow pile and at least the basal middle reddish tawny, pile of this color sometimes covering the entire segment; segments three and four usually with strong touches of yellow pile on their extreme side margins; the sides of the median segment usually with pure, or nearly pure, pale yellow pile; the face, above the bases of the antennæ, and the occiput usually with purer yellow pile than in the case of the queen.

Male.—Head.—Face and occiput mostly covered with whitish pile; cheeks with some whitish pile connecting with that on the occiput. Malar space about one-third as long as wide. Clypeus mostly covered up with whitish pile. Ocelli in the narrowest part of the vertex, the lateral ones separated by about one-half their own diameter from the margins of the eyes. Third and fifth antennal segments equal in length, the fourth much shorter than either; flagellum about two and three-fourths times as long as the scape.

Thorax.—Dorsum, pleuræ and sides of the median segment covered with whitish pile.

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Abdomen.—Dorsum: segments one and two whitish; the remaining segments mostly dark, but with considerable whitish pile on the sides. Venter with mostly whitish pile.

Wings.—Much lighter than those of the females; somewhat stained with brown.

Legs.—Coxæ, trochanters and femora all clothed for the most part with whitish pile; fore tibiæ mostly dark; middle tibiæ mostly dark or with considerable whitish pile on their hind sides; hind tibiæ with outer faces mostly bare, their front fringes short and mostly dark, their hind fringes long and dark or whitish; hind metatarsi with long and more or less whitish hind fringes.

Dimensions.—Length: queen, 17 mm. to 21½ mm.; worker, 11 mm. to 17 mm.; male, about 13 mm. Spread of wings: queen, 41 mm. to 43 mm.; worker, 26 mm. to 37 mm.; male, about 34 mm. Width of abdomen at second segment: queen, about 9½ mm.; worker, 5½ mm. to 8 mm.; male, about 7½ mm.

This species is closely allied to *B. separatus* and it is quite possible that it should be considered a subspecies or color variant of that species.

Bombus (Bombias) mexicensis new species.

Bombus ternarius (var. d.). Ant. Handlirsch, Ann. naturh. Hofmus. Wien. III, 1888, p. 230, ♀ (misidentification).

Type.—Described from four cotype queens from Mexico, of which one is deposited in the collection of the Massachusetts Agricultural College, and three in the collection of the United States National Museum.

Pile rather short and rather coarse. Malar space short. Head mostly dark. Dorsum of thorax yellow, with a broad black interalar band. Mesopleuræ mostly yellow. Dorsum of abdomen yellow, red and black. Wings rather light. Legs black.

Queen.—Head.—Short for its width. Face mostly black, but with a faint sprinkling of short pale pile intermixed with the black hair on the region around the bases of the antennæ. Occiput with mostly black pile, but with an admixture of pale yellow hairs, especially on the very hind margin. Side of heads behind eyes entirely dark. Malar space considerably shorter than its width at apex; slightly less than one-sixth as long as the eye. Clypeus shining and rather sparsely and delicately punctate. Ocelli not far below the supraorbital line; slightly above the narrowest part of the front; the lateral ones somewhat nearer to the margins of the eyes than to each other. Flagellun of antennæ about one and two-thirds times as long as the scape; the third antennal segment equal to the fourth and fifth taken together, the fifth scarcely longer than the fourth.

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Thorax.—Dorsum yellow, but with a very broad and well defined black interalar band (this band being distinctly but not greatly more than half as wide—from front to rear—as it is long—from wing base to wing base—and of nearly equal width all the way across, though slightly narrower toward the bases of the wings; the middle of the disc with a longitutinally elongate area, large enough to be very noticeable to the naked eye (this area being within the black interalar band) naked, mostly smooth and shining. Mesopleuraæ often covered with yellow pile very nearly to the bases of the legs and always with the yellow extending down as far as two-thirds of the distance from the level of the bases of the wings toward the bases of the legs. Metapleuræ sometimes clothed for the most part with yellow pile and sometimes with only their very upper ends bearing yellow hair. Sides of the median segment sometimes entirely dark, but often with considerable yellow hair.

Abdomen.—Dorsum: segment one yellow; segment two yellow on the basal middle, but with red pile on the extreme sides and along the hind margin, the yellow patch narrowing toward the front margin toward the sides of the segment; segment three red; segment four with some red and a few black hairs in the very middle, at least at the base, but for the most part clothed with yellow pile; segment five black, but with a few yellow hairs on the extreme sides; segment six dark. Venter usually entirely dark. Epipygium with a low, rounded, longitudinal median carina on its apical portion. Hypopygium also tending to be carinate on its very apical portion, in the middle.

Wings.—Only very moderately infuscate; the fore pair generally lighter across the middle portion.

Legs.—Pile, including the corbicular fringes, all dark.

Dimensions.—Length, 14 mm. to 15½ mm.; spread of wings, 34 mm. to 36 mm.; width of abdomen at second segment, 7 mm. to 8½ mm.

This species has its closest relative in *rufocinctus*, of which it may indeed be only a subspecies. I have been unable to separate it structurally from *rufocinctus*, but it may readily be separated from that species, as it is known to me, by its darker occiput and its much wider and better defined black interalar band. The yellow pile of mexicensis is pale straw yellow. The red pile is somewhat variable in shade, but, when the shade is deepest, it is perhaps best described as dark ferruginous.

Psithyrus fernaldæ new species.

Psithyrus insularis, Ashmead, Proc. Wash. Acad. Sci., IV, 1902, May 23, p. 130 (pars).

Psithyrus insularis, Ashmead, Hym. of Alaska, 1904, p. 136 (pars).

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Types.—Described from seventeen females of which five are deposited in the collection of the Massachusetts Agricultural College, four in the collection of the New Hampshire College, and the remainder (8) in the collection of the United States National Museum.

Face dark; occiput with yellow pile; dorsum of thorax entirely covered with yellow, or with a dark spot on the disc, or with a distinct dark interalar band; pleuræ yellow to, or nearly to, the bases of the legs; or with their entire lower halves dark; dorsum of abdomen usually with yellow on the sides of the first segment and on the sides of the apical margin of the third, but sometimes entirely dark except for the yellow on the fourth segment and the light ferruginous pubescence on the apical portion of the apical one. Apex of abdomen unusually strongly recurved.

Female.—Head.—Face sometimes with a slight yellow touch above the bases of the antennæ, but usually entirely dark; occiput with a large triangular patch of yellow pile; cheeks dark. Malar space nearly as long as its width at the apex; about one-fourth as long as the eye. Clypeus with its front part, especially in the middle, somewhat sparsely punctate, its base and sides being more or less densely so. Flagellum of antennæ nearly twice as long as the scape; the third antennal segment longer than the fifth and the fifth longer than the fourth.

Thorax.—Dorsum, except the small bare spot on the very center of of the disc, sometimes clothed entirely with yellow pile, sometimes with a black spot on the disc, and sometimes with a distinct though poorly defined black band between the bases of the wings; mesopleuræ usually covered with yellow pile to, or nearly to, the bases of the legs, but sometimes with their entire lower halves dark; metapleuræ with considerable yellow pile or entirely dark; sides of the median segment dark, sometimes with a few light hairs admixed; extreme sides of the metanotum (postscutellum) sometimes entirely dark, but generally with considerable yellow pile.

Abdomen.—Dorsum: segment one dark in the middle, and usually wth more or less yellow pile on the sides but sometimes entirely dark; segment two dark; segment three dark, but usually with considerable yellow pile on the sides of its apical border, segment four, except for some black pile on its very middle portion, covered with yellow pile; segment five dark, but often considerably ferruginous on the sides; segment six strongly pointed at its apex and usually bearing light brown ferruginous pubescence over a considerable portion of its surface, this pubescence being very thick and matted about the very apex. Venter dark, sometimes with a few scattering yellowish or ferruginous hairs. Hypopygium very pointed at apex, its lateral carinæ rather strongly elevated and approaching each other posteriorly considerably in front of the apex of the segment; the apical portion bearing a con-

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siderable amount of yellowish ferruginous pile, and the very tip usually extending distinctly beyond the tip of the last dorsal segment.

Wings —Considerably stained with brown, the fore pair usually darkest in the region beyond the veins.

Legs.—Mostly dark; the hind metatarsi fully three times as long as their greatest breadth, their hind margins slightly arcuate.

Dimensions.—Length, 12 mm. to 16 mm.; spread of wings 29 mm. to 38 mm.; width of abdomen at second segment, 6½ mm. to 9 mm.

Habitat.—I have records of this species as follows; Maine (Orono), Massachusetts (Amherst—a single ♀), New Hampshire (Webster, Durham, Crawfords. Mt. Washington and Conway), New York (Ithaca), Washington (Mt. Ranier), British Columbia (Kaslo and Metlakatla) and Alaska (Nushagak and Sitka). It belongs mainly to the Boreal region, but it runs over into the Transition Zone somewhat. Extensive collecting will probably extend the range of habitat given above considerably. In the West, it will probably be found to range south into Colorado and Northern California. In the East, it seems to be about as common as *ashtoni*. It is surely present in Vermont.

I am strongly of the opinion that *fernaldæ* is the female of *tricolor*. I have evidence to support this opinion as follows:

1. Both *fernaldæ* and *tricolor*, as shown by their structure, are without any very close known allies in the New World and they are the only species which appear to stand thus isolated.

2. They have about the same range of habitat, though *tricolor* has been taken in Colorado while *fernaldæ* has not.

3. The *fernaldæ* females alone ever have a touch of ferruginous pile on the sides of the fifth dorsal abdominal segment to correspond with the pile of the same color on the apex of the abdomen of the *tricolor* males.

4. The closest allies of *fernaldæ* known to me, are the females of the European species, *P. quadricolor* and *P. globosus*, and the males of those same two species are the closest allies of *tricolor*, as shown by the descriptions, figures of genitalia, etc., of Schmiedeknecht (Apid. Europ. 1882, pp. 406 and 409 and Tab. 14, figs. 4, 5 and 6). There are specimens of both sexes of both *quadricolor* and *globosus*, labeled

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by Schmiedeknecht, in the collection of the Massachuuetts Agricultural College, and I have compared them carefully with specimens of *fernaldæ* and *tricolor*, and I find from this comparison that both *quadricolor* and *globosus*, especially the former, are closely allied to both *fernaldæ* and *tricolor*. While I was unable to dissect any of these specimens of either *quadricolor* or *globosus*, on account of their value as authentic specimens, the genitalia of one of the *quadricolor* males were protruding from the end of the abdomen, and I was thus enabled to compare even the genitalia of this species with those of *tricolor*, and they are very similar, as Schmiedeknecht's figure shows. While *quadricolor* and *globosus* both differ noticeably, in some respects, in coloration from *fernaldæ* and *tricolor*, they all agree in a tendency to have some reddish pile on the apical portion of the abdomen.

I am pleased to name this species in honer of Mrs. C. H. Fernald.

Psithyrus tricolor new species.

Apathns insularis Cresson, Proc. Ent. Soc., Phil., II, 1863, p. 113, male, var. c. (probably misidentification).

? *Psithyrus insularis*, Ashmead, Proc. Wash. Acad. Sci., IV, 1902, May 29, p. 130 (pars.).

? *Psithyrus insularis*, Ashmead, Hym. of Alaska, 1904, p. 136 (pars.).

Types.—Described from thirty cotypes which are deposited in the following collections: United States National Museum, Massachusetts Agricultural College, Museum of Brooklyn Institute, New Hampshire College, Entomological Society of Ontario, Leland Standford Jr. University, Colorado Agricultural College, American Entomological Society, and the private collections of Mr. J. C. Crawford, Prof. T. D. A. Cockerell, Mr. P. G. Bolster, Boston, Mass., and Mr. H. L. Viereck.

Female.—I am strongly of the opinion that *fernaldæ* is the female of this species. See the discussion under *fernaldæ*.

Male.—Head.—Face black, sometimes with a touch of yellow pile above the basses of the antennæ; occiput with a triangular patch of yellow pile; cheeks dark. Malar space nearly as long as its width at the apex; nearly one-fourth as long as the eye. Clypeus clothed with black pile.

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Thorax.—Dorsum yellow, with usually poorly defined black band between the bases of the wings, or at least with a large black spot on the disk (when a distinct band is present, it usually extends back, in the middle, onto the middle of the scutellum); mesopleuræ usually covered with yellow pile to the bases of the legs, but sometimes with their lower portions dark; metapleuræ sometimes dark and sometimes yellow, but usually with considerable yellow pile; sides of the median segment sometimes entirely dark, but usually with considerable light pile admixed.

Abdomen.—Dorsum: segment one, entirely or mostly yellow; segment two, sometimes entirely yellow, sometimes yellow in the middle with a black spot on each side, and sometimes entirely black; segment three, entirely yellow, yellow on the sides and more or less black in the middle, or even nearly or entirely black; segment four yellow; segment five black, sometimes with a slight sprinkling of yellowish or ferruginous hairs; segment six often entirely clothed with fulvo-ferruginous pile, but frequently with more or less black pile on the basal portion; segment seven with yellowish-ferruginous, or fulvo-ferruginous pile. Venter, at least on the sides, with considerable yellow pile.

Wings.—Somewhat stained with brown, often subhyaline; the fore pair usually darkest in the region beyond the veins.

Legs.—Mostly dark; the trochanters and femora often with considerable yellow pile; tibiæ and the very tips of the femora often with considerable ferruginous hair; the tarsi with more or less fulvo-ferruginous hair.

Dimensions.—Length, 10½ mm. to 14 mm.; spread of wings, 25 mm. to 32 mm.; width of abdomen at second segment, 5½ mm. to 7 mm.

Habitat.—I have records of this species as follows: Alaska (Fort Wrangle, Juneau, Sitka and Fox Point). Alberta (Banff), British Columbia (Metlakatla), Washington (Olympic Mts.), Colorado (Ward and Pagosa Peak), New York (Brant Lake and Otto), Nova Scotia (Weymouth—P. G. Bolster, collector), and New Hampshire (Durham, Webster and Mt. Washington). It is probably also present in the following States: Oregon, northern California, Idaho, Montana, Wyoming, Utah, North Dakota, Minnesota, Wisconsin, Michigan, Vermont, Maine, and possibly parts of Massachusetts and Pennsylvania. It probably also ranges throughout a considerable portion of Canada, from the Atlantic to the Pacific Ocean. It is mainly a Boreal species, but it runs over into the Transition Zone somewhat.

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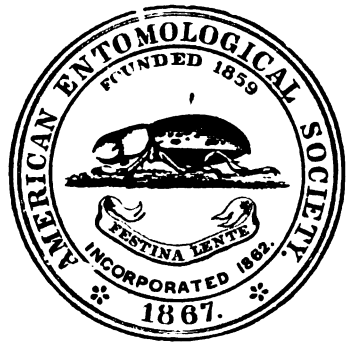

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The Larger Boreal American Hesperidæ, including EUDAMUS, ERYCIDES, PYRRHOPYGE and MEGATHYMUS.

BY HENRY SKINNER, M. D., SC. D.

My object in writing this paper is to supply students of the Lepidoptera with a work which will enable them to study and name their specimens. The literature of entomology is so scattered through various publications that it is impossible for any but those having access to large libraries to properly study their material.

It is hoped that the present paper may so cover the ground that the reader will have all required for the purpose of identification. The original descriptions are given in nearly all cases and any other information which appeared to be of value. I had intended to write a monograph but gave up the idea on account of the great amount of synonomy and the necessity of repeating so much already in print. I have considered the species under the old generic names as I consider the unisexual classification in vogue, based on secondary sexual characters, as unscientific and untenable. Those who wish to study these genera can find the desired information in the writings of Dr. S. H. Scudder; Watson in the Proceedings of the Zoological Society of London, 1893; Godman and Salvin, Biologia Centrali-Americana; Mabille, Genera Insectorum, and H. G. Dyar, Jour. New York Ent. Soc., 13, 111, 1905. They are divided into a multiplicity of genera, almost one to a species. Before the classification can be placed on a scientific foundation it will be necessary to restudy the species from a generic standpoint, omitting characters limited to one sex.

A LIST OF THE SPECIES TREATED.

Electra.
Pylades.
  Var. *immaculata*.
Bathyllus.
Mexicanus.
Mysie.
Aemilea.
Caicus.

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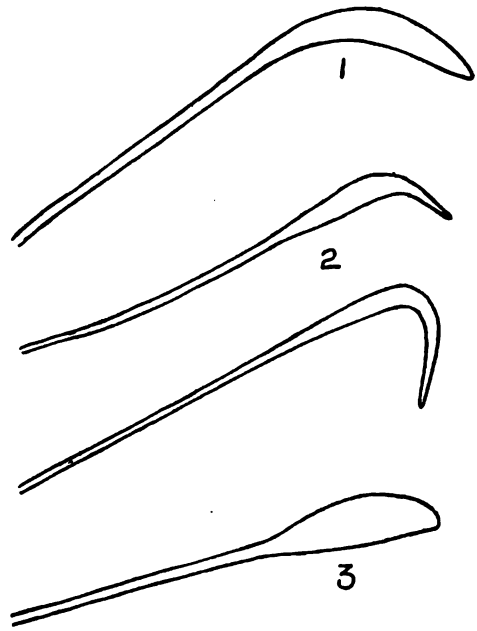
Outis.
Hippalus.
Epigena.
Drusius.
Albociliatus.
Melon.
Var. *arizonensis*.
Dorus.
Lycidas.
Cellus.
Pseudocellus.
Euribates.
Tityrus.
Zestos.
Exadeus.
Idas.
Proteus.
Simplicius.
Eurycles.
Albofasciatus.
Dorantes.
Var. *rauterbergi*
Urania.
Lilea
Batabano.
Amyntas.
Araxes arizonensis.
Yuccæ.
Var. *coloradensis*.
Cofaqui.
Streckeri,
Ursus.
Neumoegeni.
Var. *aryxna*.
Polingi.
Smithi.
Stigmaticus.

A Key to the Larger North American Hesperidæ.

1. Tails to the hind wings more than one-eighth inch in length.....27.
   Tails to the hind wings less than one-eighth inch in length or absent.....2.



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2. Club of antennæ gradually swollen, curved, and apex acute (fig. 1). **araxes.**
   Club of antennæ gradually swollen, curved, apex attenuated, often hooklike (fig. 2) ....3.
   Club of antennæ abruptly swollen, apex blunt, never curved or hooklike (fig. 3) ....21.
3. Secondaries above, with a distinct white or yellowish spot...**dorus.**
   Secondaries above, without white or yellowish spot ....4.
4. Wings above more or less tinged with green or blue; apex of antennal club abruptly attenuated and hooklike, ...5.
   Never as above ....6.
5. Primaries immaculate; secondaries with a blue submarginal fascia. **batabano.**
   Primaries above with a red costal spot ....**lilea.**
   Primaries above with white translucent maculation; area between veins, green or blue ....**urania.**
6. Maculation of primaries above conspicuous, snow-white ....7.
   Maculation of primaries above large, conspicuous, yellow ....8.
   Maculation small and white, or tinged with fuscous (rarely wanting in *pylades*) 13
   Maculation very obscure or wanting? secondaries distinctly bordered with snow-white ....**albociliata.**
7. Primaries with, at most, three large spots above not forming a band ....**amyntas.**
   Primaries with at least four large spots above forming a band. **melon.**
8. Secondaries with white or silver spot below ....9.
   Secondaries without white or silver spot below ....10.
   Secondaries below black with external area white ....**lycidas.**
9. Large spots on primaries above, coalescing, forming an incomplete band ....**tityrus.**
   Large spots on primaries above not in contact ....**exadeus.**
   Abdominal segments distinctly annulated with white ....**idas.**
10. Secondaries above cinnamon-brown with band of small fuscous spots ....**euribates.**
    Secondaries above black or dark brown, without spots ....11.
11. A continuous yellow band from costa to near interior margin above ....12.
    Band broken into distinct spots by the veins ....**zestos.**
12. Larger, expanding 44 mm., antennal club unicolorous ....**cellus.**
    Smaller, expanding 39 mm., antennal club with basal annulation of white; band of primaries tinged with orange. **pseudocellus.**
13. Club of Antennæ unicolorous ....14.
    Club of antennæ with basal white annulation ....19.

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14. Fringe of secondaries white.....15.
Fringe of secondaries tinged with fuscous, never entirely white..16.
15. Area on underside of secondaries from margin to dark band across wing, white irrorated with brown.....**epigena.**
No such distinct area.....**drusius.**
16. Primaries with two spots connected with the three costal subapical spots.....**æmilea.**
Primaries without spots of this formation.....17.
17. Maculation forming a distinct but broken oblique band. **bathyllus.**
Maculation diffuse, not forming a band, spots mere points.....18.
18. Large species, expanding 38 mm., dark in color; band of secondaries beneath, irregular and margined with black; male with costal fold.....**pylades.**
Small species, expanding 32 mm., light in color; band of secondaries beneath not margined with black; no costal fold in the male.....**nevada.**
19. Maculation conspicuous, lower spot nearly quadrate....**hippalus.**
Maculation small, lower spot much longer than broad.....20.
20. Anal angle of underside of secondaries whitish; no tuft of hairs on upperside of secondaries in male.....**moschus.***
Anal angle not tinged with white; tuft of hairs on secondaries above in male.....**outis.**
21. Secondaries above dark, immaculate, except margin.....22.
Secondaries above, maculate.....24.
22. Secondaries below with distinct triangular white spot below centre of costa.....**yuccæ.**
Secondaries below more or less spotted.....23.
23. Secondaries above without marginal lunules, larger, expanding three and a half inches.....**ursus.**
Secondaries above with marginal lunules, smaller, long hair on upperside of secondaries in the male.....**streckeri.**
24. Underside of secondaries with a whitish submarginal band.....25.
Underside of secondaries without submarginal band.....26.
Underside of secondaries with incomplete submarginal band of yellowish spots.
A row of round fulvous spots on upperside of secondaries. **cofaqui.**
25. A macular band of large fulvous spots on primaries and secondaries above.....**neumoegeni.**
Smaller (48 mm.). Maculations below, more conspicuous. **polingi.**

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* *Mysie* Dyar is not included in the key as I have no specimen of the species for examination.

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26. Secondaries below with a distinct triangular white spot below centre of costa ..... **yuccæ.**
    Secondaries without this spot ..... **cofaqui.**
27. Thorax and basal area of secondaries clothed with green hairs. **proteus.**
    Not so clothed ..... 28.
28. Primaries above with distinct spots ..... 29.
    Primaries with or without a distinct narrow band ..... 30.
29. A distinct white or silvery fascia on underside of secondaries. **albofasciatus.**
    Without such fascia ..... **protillus rauterbergi.**
30. With costal fold in the male ..... **simplicius.**
    Costal fold absent in the male ..... **eurycles.**

Eudamus (Thorybes) electra Lintner, Can. Ent., 13, 63, 1881.

"Size of small *Nisoniades juvenalis*. Primaries narrower than in *Eudamus pylades* Scudd. ♀. More rounded on the costa, and more oblique on the hind margin. Secondaries rounded, not prolonged on the anal angle as in *E. pylades*, not excavated opposite the cell as in most of the *Nisoniades*. General color dark brown, approaching that of *E. pylades;* the fringes concolorus with the terminal portion of the wings, a little paler at their tips. Primaries with eleven transparent white spots, upon which an ordinary lens shows regular rows of small black scales; the spots, as follows: Near the end of the cell (apparently open) are two spots, separated by the cellular fold and extending to the enclosing veins (subdorsal and median), the upper one twice as large as the lower and prolonged backward superiorly in one or two teeth—the lower one subtriangular in shape; above and in line with these two, in cell 10, is a small elongated spot—the smallest one on the wing, while beneath them and in range, in cell 2, extending from vein 2 to vein 3, is the largest spot on the wing, enlarged superiorly and excavated inwardly. Outside of this discal band of four spots are seven others, bordered by dark brown, and arranged in an irregular curve as follows: in cells 9, 8 and 7, three costo-apical spots oblique to the costa; outside of these, in cell 6, a spot; in cell 5, still nearer the margin, another; in cell 4, a little farther removed from the margin, another—these last three subtriangular in shape; in cell 3, extending from vein to vein, a subquadrate spot, placed farther from the margin, about equidistant with the lower costo-apical spot; these seven spots, commencing at the costa and omitting the fifth, show a regular increase in size. Outside of these transparent spots is a series of obscure dark brown internervular sub-terminal spots which merge into the dark brown shade of the margin. Inside of these spots the wing shows by oblique light a purplish reflection approaching a grape bloom but much more vivid, with the exception of the internal margin and two brown bands of the color of the outer margin and posterior

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wings; the bands extend from the subcostal to the internal vein; the outer and broader embraces the discal band of transparent spots in its outer margin, and the other crosses the median vein at its intersection by vein 2; a shade rests also on the base of the wings.

"Secondaries traversed at about their outer third by a narrow obscure brown band, inside of which the wing is dark brown; outside of this band the subterminal series of brown spots of the primaries is continued. Beneath the purplish reflection of the upper surface appears only at the tip of the wing—the median and basal portions being dark brown, concolorous with the secondaries inside of the paler brown band; the obscure intravenular brown spots of upper surface are repeated, and continued on the secondaries; the transparent spots are without the lines of brown scales. The costal vein of primaries intersects the costa nearly opposite the end of the cell; vein 8 reaches the margin at the extreme apex, not below it. Antennæ about one-half the length of the anterior wings, dark reddish-brown, marked inwardly with white at the joints, expanding rapidly into the club (the terminal half of the club lost). Palpi in length about equal to the diameter of the eyes, clothed with thick, bristly, dark brown hairs, some of which are white tipped; apical joint short, conical, projecting a little beyond the hairs. Locklet? black, curving about half way over the eyes. Front of head dark brown. Thorax above and beneath clothed with long brown hairs, concolorous with posterior wings. Abdomen darker brown, reaching only to the pale band of the hind wings. Legs dark brown; the posterior pair have the femur and tibia of the same length, bearing brown hairs, which nearly equal them in length; tibiæ armed with two pairs of spurs; tarsi twice as long as the tibiæ, moderately spinose. Expanse of wings 1.65 in.; length of body 0.55 in."

"Described from a single female received from Mr. W. H. Edwards. The specimen was captured in Hamilton, Ontario, by Mr. J. Alston Moffat, in 1877, in company with another like it, which escaped capture."

This species is only known by the unique type in the collection made by Mr. W. H. Edwards and now owned by Dr. W. J. Holland of Pittsburgh, Pa. Although captured so many years ago none have been secured since, so far as I am aware. I wrote to Mr. Moffat for any information he could give in relation to the insect and received the following reply:

"It is impossible for me to give you any information as to the generic or specific value of *E. electra*, but I can give you a detailed history of the specimen. In that remarkable year (1877) entomologically, the species was captured. The locality where I took it was a very good

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place to find 'skippers' and they were unusually abundant. *Pylades* and *bathyllus* were extremely plentiful. Strolling among them my attention was arrested by one unusually black and rich looking; I captured it and saw another one, but thinking it was only a fresher specimen than usual, and being quite green in the business I made no special effort to secure it and so passed on. Next morning when I came to spread it, I found that I had something quite new to me. I do not remember looking for more of them that season. I kept it apart for several years. Prof. Saunders was looking over my collection for the first time, and I directed his attention to it; he said he had never seen anything like it; then I began to prize it. Some time after that I sent it to Mr. Edwards who sent me word it was new, making inquiry about it and wanting to retain it telling me to keep a good lookout in the same locality at the same time of year for more, which I did but without success. I can after this lapse of time only give my impressions of it. To the practised eye, it was conspicuously distinct from *pylades* by its deeper black and richer color; also the smallness of the spots the most of them being quite inconspicuous, mere points; indeed I did not know it had so many until I read of them in Lintner's description. The ground on which I found it is a flat surrounded on three sides by hills, and marsh on the other. Clumps of witch-hazel with open spaces, grass, weeds and ox-eye daises in season were abundant. It was an excellent hunting ground for many things, but later it was turned into a cow pasture which altered its character greatly. I watched for others for years, and did think it strange that I did not see any more of them. There was but one other collector in that locality and I know he never took any."

Dr. W. J. Holland sends the following in regard to it:

"The specimen of *E. electra* has been carefully examined by me and compared with its congeners. The tips of the antennæ are, as Lintner says of the specimen, partly wanting but the tips of the palpi are all right. There is enough, however, to make it plain that the insect is congeneric with *bathyllus* and *pylades* and not with *Nisoniades juvenalis*. It is a very well marked and distinct species. It differs wholly from the others of the group in which it belongs in general aspect, and would be detected at a glance as different from any of them."

Dr. Holland kindly sent me a drawing of the species. I have no opinion to offer in regard to it and have given all the information about it in my possession. Time alone will tell whether this is a valid species or only an aberration.

Habitat.—Hamilton, Ontario, Canada. Early stages unknown.

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Eudamus (Cocceius) pylades Scudder; Proc. Bost. Soc. Nat. Hist., 13, 207, 1870.

"Mr. Scudder also stated that the butterfly described by Dr. Harris in his State Report as *Eudamus bathyllus*, a name invariably accepted by subsequent writers, was not the species originally described and figured by Abbot and Smith under the same specific name; he therefore proposed to call Harris's species *Eudamus pylades*."

Description of (*bathyllus*) *pylades* by T. W. Harris in Ins. Inj. to Veg. (Flint's Edt.), p. 312.

"It is of a dark brown color; on the fore wings is a row of small white spots across the middle, and another shorter row of only three or four contiguous spots between the first and the tip; the wings beneath are light brown, shaded at the base with dark brown; the hinder pair with a slightly prominent posterior angle, and two dark brown transverse bands. Expands from $1\frac{1}{2}$ to $1\frac{7}{10}$ inches.

Habitat.—Vanc. Isld.; Ont.; Quebec: Cala., Colo., Texas; Dak.; Maine to Fla.

Records.—Mt. Graham, Arizona, H. K. Morrison; Senator, Arizona; Cazadero, Sonoma County, California, April 23d; Philadelphia, Pennsylvania, May 30th, July 2nd; Grinnell, Iowa; Tiger Mill, Texas, March 28th, April 7th; Round Mountain, Texas, July 24th; Wilmington, North Carolina, April 26th; Salt Lake City, Utah, June 6th; Nashville, Tennessee, July 17th; Cloudcroft, New Mexico, May 21st, 27th; Potsdam, New York, June 19th; Johnston, Rhode Island, June 17th; Cumberland Mills, Rhode Island, June 10th; Mississippi.

Food plants.—*Trifolium pratense*, *Lespedeza capitata* and *L. hirta*, *Desmodium dillenii*.

"*Caterpillar.*—Last stage. Head generally pitchy black, sometimes varying to dark amber, densely covered with short whitish or hoary hairs which give it a fuzzy appearance, mounted on minute papillæ, arranged to some extent in longitudinal rows; mouth parts and ocelli black; the first joint of antennæ pale, the others dark red, the bristle very long and hyaline. First thoracic segment black, below on the sides reddish, in front edged with red or orange merging with the black, covered, as is the rest of the body, with small, short, rather stout bristles. Body behind this rather dark green with three stripes; a narrow, dark brownish green, interrupted, dorsal stripe, a similar lateral stripe of a dull salmon or flesh color, and along the basal fold

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an infrastigmatal band similar to the last but paler and indistinct anteriorly; between the two lower stripes the body is profusely spotted with more or less raised papillæ of a pale salmon color, the larger and higher distinct, the others less so, each bearing a hair similar to those on the head; marked also with a good many clustered, raised, black points between the wartlets, very abundant on the terminal segments; on the dorsal portion of the body the colors and markings are similar, but the salmon colored warts are more distinctly and highly colored, infringe more upon the dark green (which itself is hardly so dark) and are surmounted, as sometimes below, with a white or pellucid centre from which arises a white or pale brown bristle; on the terminal segments these bristles are nearly all dark brown and the black points are rather also profuse. Raised border of the spiracles black, the inner edge pale brown, outside a little paler. Basal joint of the first thoracic legs pale or colorless, the rest black edged, especially interiorly, with pale; claw blackish, other thoracic legs pale dirty yellowish; the last joint a little fuscous; claw blackish. Prolegs pale brownish yellow with an olivaceous tinge like the underside of the body; claws castaneous. Length, 28 mm.; breadth, 5 mm.; breadth of head, 4.1 mm."

"*Chrysalis*.—Colors almost entirely black and fusco-luteous or olivaceo livid. Head black, considerably mottled above with pale reddish luteous, with numerous short, curving, vinous hairs, clustered on the black spots, especially on the eyes, the mandibles and the extreme front; tongue at base luteous, edged broadly with black, just beyond black, transversely ridged with luteous, apical half fuscous; antennæ blackish fuscous, transversely marked with luteous. Prothorax like the prothoracic stigmata velvety black. Thorax above luteous marked with blackish dots and curving streaks formed of collected dots, each giving rise to a lustrous, pale, vinous hair, the streaks more abundant along the sides of the hinder edge of the mesonotum and just behind the middle of the same portion; wings fusco-luteous, marked with frequent, slender, transverse, irregular streaks of blackish fuscous, mainly following the veins. Legs like the antennæ. Abdomen sparsely haired; four basal joints pale, bespecked with black, the specks on the middle and posterior half mingled into transverse, partially associated patches; the concealable parts of the following segments are pale, unspecked; the other parts black above dotted in a transverse row with luteous. Base of cremaster black above; the rest very dark mahogany; hooks castaneous. Spiracles reddish luteous in the centre edged with a rim of black. Length (including cremaster), 19.5 mm.; height at first abdominal segment, 6 mm.; breadth at third abdominal segment, 6.25 mm.; length of cremaster, 1.75 mm."

Eudamus pylades immaculata n. var., male.

This specimen was taken at Philadelphia May 30th, and is devoid of markings on the primaries.

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Godman and Salvin in the Biologia Centrali-Americana erect a new genus for this species as follows: "*Cocceius* Nov. Gen. *Eudamus pylades*, which we make the type of this genus, has been usually placed with *bathyllus* in the genus *Thorybes*, but the presence of a costal fold to the primaries of the male indicates its true relationship is rather with *Achalaurus* (*lycidas*). From the latter genus it differs in the shape of the secondaries, which are much more rounded at the anal angle." I have given the description of the above described genus, as the costal fold is the surest means by which we can separate the two species *pylades* and *bathyllus*, the latter not having a costal fold in the male. It seems rather odd to put two species so closely related in separate genera, as they are much nearer each other than *pylades* is to *lycidas* or *drusius*, the latter also being placed in *Cocceius* by Godman and Salvin. Dr. Herman Strecker in his Catalogue did not even consider *pylades* and *bathyllus* different species. We badly need anatomical studies in the Lepidoptera but the value of the costal fold as a generic character is extremely problematical as it is common in many species of the old genus *Eudamus* and is also found in *Nisionades* and *Pholisora* and many other genera in the family *Hesperidæ*. It is folly to use even anatomical characters to form genera when the significance of these characters is entirely unknown and related and unrelated species associated together by a single secondary sexual character.

Eudamus (Thorybes) bathyllus Sm.-Abbot, pl. 22, 1797.

"Expanse of wings, 1.4 to 1.5 inches. Upper surface dark brown, about the same color as *E. pylades* with the spots enlarged. The spots in the middle of the costa of the fore wings are connected with one in the cell that extends from the sub-costal to the median vein, hourglass shaped, sometimes separated in the middle into two triangular spots. These are in line with two of the three spots below, forming a triangle, the one in the second median interspace and the one below the lower branch of the median, the spot in the first median interspace and the one below the lower branch of the median, the spot in the first median interspace being outside the line. The middle one of these last three spots is as large as the one in the cell, but is not so much constricted in the middle; the upper is next in size, and the lower one is small. The anteapical series consists of three quadrate,

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white, hyaline spots with a white spot next the costa. Hind wings without spots, but with some brown clouding in the middle. Fringes pale gray, brown at the base, cut with brown at the ends of the veins on the fore wings. Underside as in *E. pylades*, except that there is more gray on the hind margin of the fore wings, and the white spots are larger than in that species, being a little larger than on the upper side. Body and head above concolorous with the wings; below grayish, head and palpi whitish."

This species does not have a costal fold in the male.

Food Plants.—*Rhynchosia tomentosa* Torr. and Gray; *Tephrosia ambiqua* Chapm., *Centrosema virginianum* Benth.

"*Caterpillar.*—Last stage. Head black, minutely scabrous, covered with a dense pile of golden brown or tawny hairs with a few intermingled black ones, the median suture rather deeply impressed above. Ocelli, jaws and antennæ all piceous, as well as the neck. Body dull mahogany brown tinged with luteo-olivaceous, profusely sprinkled with dirty, pallid wartlets, each giving rise to a very short, scarcely tapering, minutely clubbed hair, generally luteous, often black or tipped, the black ones most abundant in the posterior part of the body. There is a very faint and narrow, dusky, dorsal line, and a faint supralateral line scarcely lighter than the ground. Dorsal shield of first thoracic segment dull black, the softer integument in front and behind is pallid, with no sign of any brighter tint. Spiracles black. Legs black. Prolegs color of body. Length of body, 23 mm.; breadth of same, 4.5 mm.; breadth of head, 4.5 mm. It differs from *pylades* in its generally darker color, in the color of the soft integuments of the first thoracic segment, and appears to be more scabrous.

"*Chrysalis.*—Dull greenish brown, the eyes and appendages with the posterior edges of the abdominal segments, the basal wing tubercles and the veins of the wings marked with fuscous brown; a few dots of the same along the posterior margin of the wing cases. It is stouter bodied than *T. pylades*. Length, 23 mm.; height, 7.5 mm. After a colored drawing by Abbot."

Habitat.—Miss. Valley to Ill.; Wisc.; Iowa; Kansas to Fla.: N. Mex.; Ariz.; Tex.; Mex.; Cent. Am. Also in New England, Conn, and Mass.

Records.—Camden and Cape May, New Jersey, August; Philadelphia, Pennsylvania; North Carolina; Tipton, Georgia, April 24th; Nashville, Tennessee, July 30th.

Bathyllus and *pylades* have been much confused in collections. The males of *pylades* are readily known by the costal fold of the primary wings. The character of the band of

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translucent spots in *bathyllus* has been found constant in the many specimens I have examined, and differs considerably from *pylades*. The fringes, palpi and undersides of antennæ in *bathyllus* are comparatively lighter in color, and the brown bands that cross the wing on the underside of the secondaries are more uniform in character, their edges not being nearly so serrate or ragged as in *pylades*. The spots on the primaries, the fringes, palpi, undersides of antennæ, and the bands on secondaries beneath if studied conjointly will enable the student to readily separate these two species in either sex.

Eudamus (Thorybes) mexicanus Herrich-Schaeffer.
Eudamus (Thorybes) *nevada* Scudder, Rept. Peabody Acad. Sci., 1871. (Syst. Rev. Am. Butt.)

"Closely allied to *T. bathyllus*, but measuring only 34 mm. in expanse of wings. The under surface of hind wings is very delicately marbled with fine short transverse lines, giving the outer half of the wing a hoary appearance: in the lower half of the wing one may distinguish rudiments of two darker bands at about two-fifths and three-fifths the distance from the base, the inner one reaching to the middle of the wing. Sierra Nevada, California (Henry Edwards)."

There seems to be considerable doubt as to what *E. nevada* really is. Dr. Strecker in his Catalogue (1878) puts it as a synonym of *pylades* which he erroneously considered a variety of *bathyllus*. Mr. W. H. Edwards in his Catalogue (1884) gives the localities as Texas, Arizona and Colorado, not mentioning the locality from whence came the types. Godman and Salvin in the Biologia say: "The loan of the type of Herrich-Schaeffer's *Eudamus mexicanus*, enables us to state that it agrees with a series of specimens in our collection from Mexico and Western North America, the latter sent to us by Henry Edwards and Mr. Strecker under Mr. Scudder's name *T. nevada*." The Biologia further gives the following synonymy:

Thorybes mexicanus Biol. Cent-Am., p. 334, tab. 80, figs. 15, 16, 17 ♂.
T. mexicanus Herr-Schaeff. Prodr. 3, p. 68, 1868.
T. nevada Scudder, Rept. Peabody Acad. Sci., 1871.
T. ananius Plotz, Stett. Ent. Zeit., p. 99, 1882.

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Mr. Scudder's description is inadequate to identify this species or variety, and it is therefore in some doubt. Mr. Scudder sometime ago kindly sent me one of his two types of *nevada*, but it was in such poor condition that I could make little out of it.

Additional material from the United States and Mexico leads me to consider the synonymy in the Biologia to be correct.

Records.—Mt. Graham, Arizona; Cloudcroft, New Mexico, May 27th; Silver Lake, Utah, July 12th; City Creek Cañyon, Utah, July 15th; Colorado; Popocatepetl Park, Mexico, 8100 feet, Sept. 17th, P. P. Calvert; Real del Monte, Hidalgo, Mexico, August 30th; Uruapan, Mexico.

Eudamus (Phaedinus) mysie Dyar.

Eudamus (*Thorybes*) *mysie* Dyar, Journ. N. Y. Ent. Soc., 12, 40, 1904.

"*Male.*—Without costal fold, anal angle of secondaries scarcely at all produced, wings broad, trigonate. Fuscous brown, fore wings with whitish subhyaline spots; one in the end of cell, constricted or divided, a subcostal one above it; two subapical, one between veins 6 and 7 beyond these, one between veins 5 and 6, another between 4 and 5 still further out, the upper one sometimes wanting; a large one between veins 3 and 4 less far out, a still larger one between veins 2 and 3 slightly constricted and in an oblique line with the spot in the cell and on costa; a small one below vein 2 still further out and forming part of this straight line of spots, sometimes wanting. Fringe light fuscous. Fore wings below with the spots repeated, margins washed in purplish and spotted fuscous. Hind wing purplish fuscous, two submacular bands of brownish black edged, conjoined spots, the outer followed by a diffuse light band. Expanse 37 to 40 mm."

"Described from two specimens, Patagonia Mountains, Arizona (E. J. Oslar). Type.—No. 7737, U. S. National Museum.

Allied to *T. mexicanus* Herr-Schaeff., and with much the same style of markings. It is, however, larger, without dark edging to the pale spots which are less whitish and the underside of the hind wings is marked much as in *Phaedinus caicus* Herr-Schaeff., with distinct, well contrasted markings, not in the obsolete manner of *T. mexicanus*."

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Eudamus (Thorybes) æmilea Skinner, Ent. News, 4, 64. 1893.

"*Male.*—Expands 1¼ inches and the ♀ 1½ inches. Wings are a gray-brown similar to *E. bathyllus*, yet when compared with the latter species there is a marked difference in color; yet it is almost impossible to describe it in words. There is a somewhat light and grayer area in the middle of the secondaries of *æmilea*. Upperside.—Primaries: In three specimens there is a white dot near the outer end of the discoidal cell, and in two specimens there are two of these white spots; there is a crooked row of white spots running across the outer third of the wing from the costa nearly to the interior margin. First come the three nearly united spots, which are present in so many species; then below these and further toward the exterior margin are two others, the lower one of the two points toward the tip of the wing; then further toward the base is another spot, and below this and still further toward the base is a spot made up apparently of two coalesced; below this and outward, nearer the exterior margin is the last spot, which is usually square in shape. In one male the coalesced spot is nearly obsolete; the inferiors are immaculate. The wings are edged with a narrow black border, and the fringes are grayish; some of the hairs from the black border run through the fringes, from the wings, giving the edge of the wings a scalloped appearance.

"*Underside.*—The spots above are repeated beneath; the wings beneath are much lighter in color, and the inferiors have two black bands running across them.

"This is a smaller species than *bathyllus* and is a different color; it wants the inner costal spots found in *bathyllus* and *pylades*, and leaving out the inner costal and discal spots it has eight spots remaining, and none of the allied species have this many. That it is a new species is apparent to the eye, but it is one of those difficult things to picture in words. From five specimens, two males and three females, taken by Prof. Edw. T. Owen, at Fort Klamath, Oregon, I take pleasure in naming the species after the wife and eldest daughter of Prof. Owen."

It is possible that this may eventually prove to be the same as *mexicanus* or *nevada*.

Habitat.—Fort Klamath, Oregon. Life history unknown.

This form or race may be distinguished from *mexicanus* by the heavier and larger translucent spots, and the fact that it has two additional spots below the three costal spots found in this form and in *mexicanus*.

Records.—Fort Klamath, Oregon, June 4–23; Yosemite, California; Lundy, California, July 19th. Fort Klamath has an elevation of 4150 feet.

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Eudamus (Phaedinus) caicus Herr.-Schaeff., Prodr., p. 68, 1868.
Eudamus moschus Edwards, Papilio, 2, 141, 1882.
Eud. schaefferi, Plotz, Stett. Ent. Zeit., p. 99, 1882.

The above synonymy is given by Godman and Salvin in the Biologia Centrali-Americana with the following explanation: "Dr. Standinger has kindly lent us a specimen of this species which bears the name *Eudamus caicus* Herr.-Schaeff. with the type of which it has doubtless been compared. It agrees with a series of examples we possess from Guatemala and Southern Mexico, but those from our Northwestern frontier are rather paler, the palpi are whiter, and the hyaline spots of the primaries are larger. The latter probably belong to Mr. Edwards' *Eudamus moschus* from Arizona. We hesitate to separate them from the darker more southern form, especially as the male genitalia do not differ in any way."

My Mexican specimens do not differ materially from the large series of Arizona specimens in my possession.

"*Male.*—Expands from 1.3 to 1.7 inch. Upper side very like *hippalus*. Glossy brown, with nine whitish, semi-transparent spots on primaries, of which four are subapical on costa, three across discoidal and median interspaces, in an oblique line, one in cell and another above this; these spots are all small, and those in the cell and lower median interspace are much smaller than in *hippalus;* fringes of primaries whitish-brown, except at outer angle; these as in primaries. Underside of both wings brown, mottled with dashes about apex of primaries, and crossed by two black bands, and a demi-band on secondaries is nearly as dark as the bands, and the margin is gray, but usually the contrast is decided between the ground and bands; the spots of primaries repeated. Body above dark brown, beneath thorax gray-brown; abdomen same (in some cases light, with a dark ventral line); legs yellow-brown; palpi yellowish, with brown hairs; antennæ black above, luteous beneath; club black above, yellow beneath; the tip ferruginous.

"*Female.*—Expands about two inches. Similar to male. From 6 ♂s and 6 ♀s from Arizona."

This species was taken abundantly in Arizona by H. K. Morrison in 1883.

Habitat.—Arizona; Sonora, Orizaba, Acaguizotla, Mexico; Polochic Valley, Duenas, Guatemala.

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Eudamus (Cogia) outis Skinner, Ent. News, 5, 332, 1894.

"This species is somewhat smaller than *bathyllus*, but in color comes closer to *moschus* and *hippalus*. If the recent subdivisions of the genus are accepted it would go in the genus *Cogia* along with *hippalus*. It expands one and three-eights inches (distance from middle of thorax to apex of wing doubled). The superior wings have the same translucent white spots common to this section of *Eudamus* There are three of these spots on the outer third of the costa, and a small point below and toward the outer margin. In the centre of the costa is a linear spot which runs parallel to the costa; below this and not in line, is another spot; the eighth and last spot is in the centre of the outer half of the wing. In one specimen the discal spot is divided. The inferiors are immaculate, and have a small tuft or pencil of hairs arising from the base of the abdominal fold. Fringes cinereous. Underside: Superiors with the same translucent spots as above. Inferiors as in the other allied species. It may readily be distinguished from the other species of *Eudamus* (except *hippalus*) by the tuft of hairs on the secondaries. Differs from *hippalus* in not having the characteristic white fringes of inferiors and is a much smaller species—being only about one-half the size.

Described from four males from Round Mountain, Blanco County, Texas, Aug. 27, 1894.

Types in collection of the Academy of Natural Sciences of Philadelphia.

Females have subsequently been received and are a little larger than the males and lack the abdominal tuft which is a male character."

Eudamus (Cogia) hippalus Edw., Papilio, 2, 27, 1882.

"*Male*.—Expands 1.6 inch. Upperside glossy-brown; primaries have at three-fourths the distance from base to apex, four minute, whitish, semi-transparent spots on costal margin, three of them in perpendicular line, the fourth a little outside; a similar spot in lower discoidal interspace, a small rectangular spot in upper median a large rhomboid in lower median interspace; these three in an oblique line; a bar across cell just above the rhomboid, and above cell a dash nearly parallel to costal edge; fringes of primaries alternately fuscous and

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dull white, the dark shade prevailing at apex, of secondaries white with short brown hairs at ends of the nervules, but which do not entirely cross the white. Underside brown, much dusted with gray scales, especially over secondaries and at apex of primaries; inner margin of primaries yellowish; secondaries crossed by dark bands, one on disk, the other beyond; there is also a demiband near base; the spots of primaries repeated and a little enlarged, and in addition there is a light brown patch lying between the outer spots and opposite cell. Body brown above, beneath thorax gray-brown; abdomen whitish, with a brown line in venter; legs gray-brown, the outside of tibiæ white; palpi white with brown hairs; antennæ black above, annulated with yellow beneath; club black above, yellow beneath, and above also at base, tip ferruginous."

From two males taken at Tucson and at Prescott, Arizona.

Habitat.—Southern Arizona; Mexico.

Food plants unknown.

"This species has in the male a small tuft or pencil of hairs arising from the base of the abdominal fold of the inferior wings, and has therefore been placed in the genus *Cogia* of which *C. cajeta* Herr.-Schaeff. is the type." (Godman and Salvin in the Biologia Centrali-Americana.)

Records.—Mt. Graham, Arizona (H. K. Morrison); Organ Mountains, New Mexico, Aug. 30th (C. H. T. Townsend).

Eudamus (Rhabdoides) epigona Herr.-Schaeff., Prodr. 3, p. 59, 1868.

Eud. epigena Butler, Tr. Ent. Soc., Lond., 4, 493, 1870.

"Wings above, dark brown; front wings with a spot at the end of the cell, three placed obliquely between the median branches, one below the first median branch and near outer margin, and three together in oblique line near the apex, fringe gray; hind wings with white fringe. Front wings below, paler, excepting within the cell and from the cell to the costa, which is dark brown; apical area hatched with dark brown, hyaline spots as above; hind wings almost exactly as in *E. orion;* body dark brown. Expanse of wings, 2 inches, 1 line."

Food plants unknown.

Habitat.—Arizona; Southern Texas; Mexico; Guatemala.

Eudamus (Cocceius) drusius Edw., Can. Ent., 15, 211, 1883.

Cocceius drusius Godman and Salvin, Biol. Cent.-Am., 2, 336, 1894.

"*Male.*—Expands 1.7 inch. Upperside glossy dark brown, with eight minute semi-transparent spots on the primaries, four of them subapical on costal margin, three in discoidal and median interspaces,

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one at right angles to the lowest of the three, in submedian interspace towards hind margin, one in cell; fringes of primaries fuscous, at inner angle cinereous; of secondaries white, cinereous at outer angle. Underside dark brown, the hind margins lightly dusted with whitish scales; the spots on primaries repeated, a little enlarged; secondaries crossed by two obscure bands, with black outlines. Body above dark brown, beneath dark gray-brown; legs gray-brown; palpi either dark gray, or with so many brown hairs as to nearly conceal the whitish ones; antennæ black above, beneath finely annulated with luteous; club black above, luteous below.

"*Female.*—Expands 1.7 inch. Similar to the male. This species is near *moschus* Edw. It has the spots fewer in number, smaller, and differently disposed; beneath is darker, and the bands on secondaries are indistinct; abdomen below without ventral line; legs and palpi different color, the latter in *moschus* yellow."

Taken in Southern Arizon by Mr. Morrison in 1883.

Habitat.—Southern Arizona; Sonora, Mexico.

Eudamus (Murgaria) albociliatus Mabille.

Mabille, Pet. Nouv. Ent., 2, 162, 1877; Ann. Soc. Ent. Belg., 21, 25, 1878.

Biologia Centrali-Americana, 2, 333, 1894, pl. 80, figs. 12, 13. 14.

Eudamus coyote Skinner, Can. Ent., 24, 164, 1892.

"*Teleg. albociliatus.* Wings black with a dirty fringe and an antecellular band of fuscous spots hardly perceptible which proceeds from the costa as far as the internal margin.

"Hind wings immaculate, with a broad snow-white fringe. Below, the front wings are paler with the antecellular black band described and a reddish internal angle. Hind wings black with two transverse discal black bands not touching the anal space and obsolete at the anterior margin. Colombia, Panama, Guatemala. In collection of Paris Museum, Royal Museum of Belgium and P. Mabille. This species is to be referred to the true *Æthillos.*"

Habitat.—Texas; Mexico; Cent. America; South America.

Records.—Alta Mira, Mexico, July 14th; Kerrville, Texas, July (Dr. Wm. Barnes); near Corpus Christi, Texas (S. F. Aaron).

Eudamus (Heteropia) melon Godman and Salvin.

Godman and Salvin, Biologia Centrali-Americana, 2, 296, 1893, 4, 76, figs. 26, 27.

Var. **arizonensis** Skinner, Ent. News, 16, 232, 1905.

"We have specimens of *melon* from Colima, Mexico, that agree perfectly with the figures in the Biologia. The speci-

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mens of var. *arizonensis* were taken by Mr. O. C. Poling in the Baboquivari Mountains, Pima County, Arizona, July 15th to 30th, and differ from typical *melon* in having the marginal border of the secondaries below (outer third of the wing) very much whiter."

Melon is found in Western Mexico: State of Vera Cruz and Montagua in Guatemala.

Eudamus (Plestia) dorus Edw., Papilio, 2, 140, 1882.
Plestia dorus Godman and Salvin, Biol. Cent.-Amer., Rhop., p. 290, tab. 76, figs. 8, 9 ♂.
Dorus Edw., Papilio, 2, 140, 1882.

"*Male.*—Expands 1.6 inch. Upperside dark brown, with whitish semi-transparent spots; primaries have three small subapical spots on costa, a dot below just these, towards hind margin; three large spots in the median and submedian interspaces, in a line parallel to hind margin; a small spot near middle of costa, a large patch under this, in cell, and a large subrectangular spot at origin of lower median interspace; secondaries clothed with long, dark-gray hairs, across disk a line of four whitish spots; fringes of primaries dark cinereous, alternating with brown; of secondaries light cinereous, but next anal angle brown.

"Underside brown, the inner margin of primaries yellowish; the spots repeated, enlarged, and more or less confluent on primaries. On secondaries the spots are much dusted with brown scales; both wings much covered with whitish or bluish-white scales, especially dense on apical area of primaries and over outer limb of secondaries, but nearly as dense at base of these last; secondaries have two blackish transverse narrow bands, the outer one in line with the spots, the outer half-way from this to base, and the two are connected by a broad ligament of same color on underside of cell; near base three small brown patches. Body above brown, underneath gray-brown; legs brown, annulated white; palpi white with many gray hairs on uppper part; antennæ black, annulated on underside with white; club deep ferruginous, white on underside.

"*Female.*—Expands 1.7 inch. Like male; the spots rather larger."

Graham Mountains, Arizona.

Habitat.—Arizona; New Mexico; North. Sonora, Mexico.

Records.—Carr Cañyon, Huachuca Mountains, Arizona, August (Skinner); Mt. Graham, Arizona (H. K. Morrison); Cloudcroft, New Mexico (Viereck).

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Eudamus (Achalaurus) lycidas Sm.-Abb., Ins. Ga., pl. 20, 1797; Bdl.-Lec., Lep. Am. Sept., t., 71, 1833; Scud., Butt. East., U. S. and Can., 2, 1418, pl. 9, fig. 11.

"Expanse of wings from 1.9 to 2 inches. Upper surface dark brown, slightly yellow tinted, with a purple reflection along the costa. The fore wings are crossed from near the middle of the costa in a direction towards the posterior angle by a yellow band of spots, consisting of the same spots as are found in *E. bathyllus*. The spot in the cell and the one in the second median interspace are greatly enlarged, so as to be nearly or quite quadrate; the others also are enlarged, but not to the same extent. Beyond this band there is the usual ante-apical row of four spots, the fourth a little out of line, and, not in line with the others, a small triangluar spot above the base of the first median nervule. Hind wings without spots. Fringes of fore wings dark brownish gray, cut with black at the ends of the veins; those of the hind wings with the pale part paler; those of the inner margin black; a black line edging both wings, and shading in a little on the hind wings. Underside of fore wings brown, blackish inside the mesial band, grayish along the hind margin, the apex shaded with black and having a few whitish scales. The spots of the mesial are more confluent than above, the others less distinct.

"Hind wings with the base dark, slightly grayish; through the middle an irregular broad black band, not reaching either margin, and having a large patch of brown in it at the end of the cell, the black sprinkled with gray scales. Outside of this to the margin of the wing it is pure white through the middle half; the apical portion, the anal portion and along the margin white more of less tinged with brown; the whole crossed by abbreviated brown streaks. Body black, the underside of head and palpi slightly sprinkled with gray."

Food plants.—Desmodium dillenii; D. paniculatum; Indigo, Indigofera; Ipomæa pandurata.

"*Caterpillar.*—Last stage. Head black, uniform, not heavily scabrous, the rugosities having a tendency on the front to form lines converging on the mandibles; the denticles of posterior summit curved forward. Hairs uniform, short, fulvous; all mouth parts black.

"Body dark green with a bluish green, moderately broad dorsal line, the body heavily besprinkled with yellowish orange dots on and surrounding the papillæ, giving it a somewhat rusty appearance; these become more orange in a narrow lateral stripe, but not in the broader and vague infrastigmatal stripe; besides, the body between the brighter dots is frequently pointed in black specks, generally clustered in lines or small spots; on the last three segments the rust color is more marked; the thoracic shield is black brown, smooth, slightly shining, with short, black, non-tapering hairs, the front edge of the segment pale blood red. Hairs of body pellucid; spiracles black with a slender, inconspi-

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cuous, testaceous annules surrounded by a pale areola. First pair of legs black, others color of body; the claws fulvo-testaceous. Length of body, 35 mm.; breadth of body, 5.6 mm.; of head, 4.5 mm.; of first segment, 3 mm.

"*Chrysalis.*—Color of anterior parts whitey brown, darkest toward head, of the abdomen sordid yellow brown; all the prominences of the head are marked with minute papillæ clustered into black patches; similar black or blackish fuscous papillæ are scattered irregularly and sparsely over the thorax, sparsely and with considerable regularity over the abdomen, being arranged very largely in transverse lines; each gives rise to a short brown bristle, mixed with some piceous ones; these bristles are stout, equal, truncate; prothoracic spiracles black-brown, shining; cremaster fusco-castaneous. Length, 21 mm.; breadth, 6 mm."

Habitat.—Ill.; Wisc.; Miss. Valley to Gulf of Mexico; Nashville, Tenn., July 16th; Glenside, Pa., May 29th.

Eudamus (Rhabdoides) cellus Bd.-Lec., pl. 73, 1833.*

"Expanse of wings from 1.9 to 2 inches. Upper surface dark blackish brown; fore wings crossed by a broad continuous yellow band, beginning near the middle of the costa and ending in a point near the posterior angle, bending inward a little here towards the hind margin. From costa to the lower branch of the median the band is of nearly uniform width, but the rest of the distance it tapers a little. The inner edge is nearly straight, but the outer sends out an angle just below the end of the cell. Three-fourths of the distance from the base, extending from the costa back, is a short anteapical line composed of three quadrate coalescing yellow spots, and a small dot next the outer lower corner of the third spot. Hind wings without marks, except a little yellowish at the apex. Fringes black or blackish, with a few gray or whitish spots between the veins. Underside of fore wings the same as the upper, except that the hind margin is gray, the apical half of the outer margin reddish brown, and the costal portion of the mesial band and anteapical line paler yellow. Hind wings dark purplish brown, with three irregular, somewhat poorly defined, darker brown bands, and a very slight sprinkling of buff scales. Along the outer margin is a series of deep brown lunules surrounded by scattering pale blue scales. Body black, underside of palpi and head pale ochraceous."

This species is a very well defined one, and may be known at once by the golden band across the fore wings.

Habitat.—West Virginia to the Gulf of Mexico: Texas; Arizona; Mexico; Putta on the Pacific Slope, Colima, Milpos

* Godm.-Salvin, Biol. Cent.-Amer., 2, 331, 1893, t. 80, f. 8.
Festus Hub., Zutr. Ex. Schmelt., figs. 907, 908, 1837.

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in Durango, Ceurnavaca, Xucumanatlan, Omilteme, Pinal, Mexico City, Oaxaca; Nashville, Tenn., Aug. 19th (Osborn); Tallahassee, Fla., Apr. 17th (Maynard); Georgia, Apr. 25th (Abbot).

"*Caterpillar.*—Last stage. Head black, with a large, bright orange spot at the front base of each hemisphere, lying at the bottom of a large, pale lavender spot, which covers more than half of the front. Body green, with a slender, darker green, dorsal line, a broad, pallid, stigmatal stripe, above which the sides are obscured with darker green, dorsal thoracic shield narrow, equal, black, the part of the segment in front very pale brownish yellow, like the legs and under surface. Length 36.5 mm. Described from the figure by Boisduval and Le Conte.

"*Chrysalis.*—Uniform pale yellowish brown, the incisures dusky. Length, 24 mm.; height, 5 mm. From Boisduval and Le Conte." (Scudder.)

Food plant.—Breweria aquatica.

From the dates of capture it would appear that there are two broods of this species. "In Montgomery County, Virginia, *cellus* is occasionally taken in the watered rocky ravines where the wild catnip covers the ground" (Smyth).

Eudamus (Rhabdoides) pseudocellus.

Achalarus pseudocellus Coolidge and Clemence, Ent. News, 23, 3, 1911.

"*Male.*—Upper surface of primaries brownish-black, somewhat lighter along the external margin, and sparsely dusted with whitish atoms, a macular band extending from costa across end of cell and abruptly terminating about 2.5 mm. from lower angle; this band is divided by the nervules into five spots as follows: first, quadrate; second, elongate; third, with the nervules Y-shaped and projecting outwardly; fourth, quadrate; and the fifth, triangular; the formation of this band is similar to that of *cellus*, and is quite regular, the fifth spot, however, varying considerably in size and shape; color of first spot pure yellow; the second orange, slightly tinted with yellow anteriorly; the others all orange; midway between this band and the apex a small procurved whitish-yellow bar; otherwise immaculate. Secondaries concolorous with primaries, immaculate, fringes of primaries at lower angle whitish, becoming black checkered as they approach the apex, where there is usually a distinct whitish patch of fringes. Fringes of secondaries checkered black and gray. Primaries beneath with spots reproduced; color as above but considerably lighter along outer margin and dusted sparsely with grayish scales; inner angle clouded with buff, in some specimens a distinct whitish point below

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bar of costa, and in others another similar point immediately outward of end of costal bar; one or both of these may reappear faintly on upper surface. Secondaries beneath brownish; two irregular wavy dark brown bands, heavier than the ground color; between these bands along the outer margins the coloration is pallid; scattered gray scales, heavier at anal angle than elsewhere. Fringes of primaries beneath as above; on secondaries the fringes are brownish, the whitish of above being greatly diminished. Antennæ brown with a white color at base of club; beneath whitish yellow; thorax and abdomen dark brown; palpi yellowish-gray. Expanse 1.30 to 1.50 inch. ♀."

We do not discover any essential differences in the female, either as to size or ornamentation.

Type locality. — Ramsey Cañyon, Huachuca Mountains, Cochise County, Arizona, 5000–7000 feet altitude.

Described from two males and two females in the collections of Coolidge and Clemence, and from 67 cotypes, five of these in the collection of Dr. Barnes."

The authors state that the species was taken from June 7th to July 10th. It was plentiful in early July.

This is likely to prove the spring form of *cellus*, the form from wintering chrysalids.

There is a specimen of *pseudocellus* in the collection of the Academy of Natural Sciences of Philadelphia bearing the label, "Real del Monte, Hidalgo, Mexico, April 13th, 1908."

Eudamus (Nascus) euribates Cram., Pap. Exot., t. 393, f. D, (♀), 1782.

Hesus West.-Hew., Gen. Diur. Lep., pl. 78, f. 5, 1852.

"Expanse 2¼ to 2⅝ inches. Primaries much produced apically. Ground color rich rufous brown, shaded with deep umber on outer and abdominal margins, and approaching black-brown on costal margin of secondaries. Primaries with three subapical honey-yellow spots, the upper very minute; an irregular discal patch of the same color translucent, resembling a three-leaf clover in shape, and composed of three unequal outwardly notched spots, extends from the costal area well towards the posterior angle. This patch is faintly margined by black; at the juncture of the three spots there is a triangular spot of the ground color. On the costal margin a deepening of the scales and a deep incision running therein for about one-third the length of the wing presents the appearance of an aborted costal fold; sometimes this area is a lavender-gray color. On lower margin towards base there are two small black spots and two small less distinct just below the outer angle of the discal patch; these seem to be a disconnected continua-

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tion of a band of two or three still fainter on apical area. Secondaries have a small round black spot on disc and a row of five or six of the same color, and a varying size parallel to the outer margin.

"Beneath the ground color is much duller in tone and more clouded. Honey-yellow spots, of the primaries above, reproduced; black points wanting. Secondaries without the broad area of black-brown on costal margin; the spots of the upperside are replaced with spots of a lighter color than the ground encircled with brown fuscous. The row of spots parallel to the outer margin is made to continue in its submarginal course by the addition of two spots placed parallel to the costal margin. Beneath the discal spot and towards the abdominal margin there is another somewhat smaller.

Body and thorax above and below concolorous with the wings; head above the same, below much brighter. Antennæ annulated with black and the general color, brighter at base of tip, then black, and finally ending in a long tapering tip of the general color."

Habitat.—Texas; Mexico; Central America; Brazil.

Eudamus (Epargyreus) tityrus Fabr., Syst. Ent., 532, 1875.

Wings somewhat tailed, brown; the anterior with a yellow band on each side, the posterior snowy beneath. Antennæ black, hooked. Anterior wings uniform brownish, with a short band and another spot, apices yellow; posterior somewhat tailed, spotless above, beneath with a broad, very white band. The brown Carolinan *Papilio* marked with pellucid golden, whitish beneath.

Food plants.—Amorpha fruticosa, Robinia pseudacacia, R. vicosa, R. hispida, R. neomexicana, Wistaria frutescens, Lespedeza capitata, Lathyrus paluster, Apios tuberosa, Desmodium marylandicum, Desmodium nudiflorum, Amphicarpaea monoica, Desmodium canadense.

"Last stage of *caterpillar.*—Head dark brownish red, delicately scabrous and clothed with short pile; between the ocelli and the labrum a large, roundish, bright orange spot. Body greenish yellow marked with transverse lines, blotches and dots of grassy green; the lines encircling the body above, the blotches being abundant on the sides and the dots forming a transverse row on the outer anterior edge of each segment. Collar just behind the head, dark brownish red; first thoracic segment orange-red; the shield browner and its hinder edge delicately infuscated; last segment greenish, rimmed posteriorly with yellow; beneath dark green dotted with yellow excepting the first segment which is red. The body is densely covered with exceedingly short, fine hairs. Spiracles velvety black, bordered with pale green; second and third thoracic segments, but especially the former, marked with black in the place where the spiracles would be if there were any.

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Legs orange-red, the front pair brighter, the claws infuscated. Prolegs greenish, all but the anal pair marked externally with transverse bands of pale orange. Length, 37 mm.; breadth of body, 6.25 mm.; of head, 5 mm.; collar, 2.25 mm." (Scudder).

"The *chrysalis* is .76 inch long, the head case blunt conical; the dorsum from near the head nearly straight; the ventral side strongly ventricose, tapering abruptly from the end of the ring cases to the tip of the abdomen, the cremaster a somewhat triangular piece, .06 of an inch long. Color reddish-brown, finely mottled and spotted with dark brown, the end of the humerus blackish-brown, with two smaller spots between them. Stigmata and eyes darker than the general color" (French).

Habitat.—Br. Am.; Ont.; Queb.; United States generally; Mexico; Antilles; Sth. Am.; Nashville, Tenn., July 7th to July 27th; Miami, Fla., January.

Eudamus (Epargyreus) zestos Hub., Zutr. Ex. Schmett., figs. 615, 616, 1832.

Oberon Worth., Papilio, 1, 132, 1881.

Tityrus var. *zestos*, Aaron, Papilio, 4, 26, 1884.

"Expanse of wings from 2.2 to 2.4 inches. Upper surface dark brown, with a slight bronze reflection, marked almost like the upper surface of *E. tityrus*. There is a yellow band from near the middle of the costa back towards the posterior angle, ending in a blunt point about the middle of the medio-submedian interspace, the point below the lower median fork being about twice as large as in *E. tityrus*. The inner edge of the band above the median fork is nearly straight, being notched a little at the subcostal vein, but is a little more oblique than in *E. tityrus*. The outer edge is more irregular, the spot in the cell and the one in the lower median interspace being concave, and there are notches at the median and subcostal veins. The spot outside the band in the first median interspace is nearly square. Beyond the band is the usual anteapical line of three spots, extending obliquely outward in a curve. Underside of about the same general color as the upper, the fore wings with the marking of the upper surface. The hind wings have a faintly indicated median band of a slightly paler color than the rest of the wing, not reaching either margin, and two faint spots between this and the anal angle, and more or less scattering tawny scales. Both wings below have a strong purplish reflection, the outer margin slightly paler. Fringes concolorous with the wings, the hind wings paler, but without brown at the ends of the veins. Body above purple brown; thorax covered with tawny hairs, beneath more or less shaded fulvous; palpi fulvous. Club of antennæ brown above, fulvous below and at sides. This species strongly resembles *tityrus* above, but the yellow spots are less confluent and more

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opaque, the general color is deeper, and the fringes are not divided by brown at the ends of the veins. The underside lacks the conspicuous silvery white band on underside of the hind wings."

This species flies with *tityrus* in South Florida, and seems to be distinct and invariable.

Habitat.—Sanford, Marco Island, Key West, Miami, Fla.

Eudamus (Epargyreus) exadeus Cram.

Cram., Pap. Exot., t. 260, f. C, 1782.

"The upper surface of the wings does not differ from Fig. A, but below the pattern varies from it [fig. A] and chiefly that of the inferior wings. All the white spots and points of these wings have a silver lustre, but the yellowish spots of the superior wings are transparent. It belongs to the family of noble plebians, comes from Surinam, and is in the cabinet of Mr. W. van der Meulen."

Habitat.—California; Mexico; Cent. Am.; South Amer.; Trinidad.

This species is placed in our fauna from a specimen from San Luis Obispo, Calif. Taken in fresh condition in March.

Eudamus (Proteides) idas Cram.

Cram., Pap Exot., 3 pl., 260, f. A B, 1782.

"The hair obscure yellowish, that which the body and a part of the upper surface of the wings are covered has a sickly lustre. The yellow spots of the superior wings transparent. It belongs to the noble plebians (Pap. Pleb. Urbicol.) and lives at Surinam."

Habitat.—Arizona; Texas; New Mexico; Mexico; Central and South America; Haiti.

Eudamus (Goniurus) proteus Linn., Syst. Nat., 1, 2, 794, 1767; Godm.-Salvin, Biol. Central-America, p. 277, pl. 75, f. 58 (gent.).

"Wings tailed, brown; spots latticed; antennæ hooked. Lives in grass of America."

"Upper surface dark olive-brown; base of fore wings, basal half of hind wings, and upper part of body with light green hairs. The fore wings have an oblique transverse row of four whitish hyaline spots extending from the costa near the middle to near the posterior angle. Beyond this row is a spot in the first median interspace, constricted in the middle; and beyond the cell is an anteapical row of five spots, curved, the first two spots oblong, the third nearly quadrate, the fourth and fifth elongate in the direction of the line, the fourth often divided in the middle into two spots. Hind wings without spots, the anal angle produced into a tail; outer margin dentate. Fringes of fore

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wings gray, but with brown at the ends of the veins; of hind wings white, except those of the tail on the inner margin, which are black. Underside of fore wings brown, the costa at base, the area between the two bands, and the outer margin purplish fuscous. The spots are enlarged, and are more confluent than above. The hind wings have the same glaucous color all over their surface excepting the tail, the anal two-thirds of the outer margin, and the two bands through the wings, which are olive-brown, the tail almost black. The inner of these two bands reaches only to the subcostal vein, and above that and a little to each side are two black patches. The whole surface is sprinkled over with a few whitish and yellow scales. Palpi pale gray, underneath almost white."

Habitat.—Connecticut; New York to Gulf of Mexico; Central America to Argentina; Antilles. Mexico: Mazatlan, Venta de Zopilote, Cuesta de Misantla, Orizaba. Guatemala? Chisoy and Polochic Valleys, San Geronimo, Dueñas, Zapote. Honduras: San Pedro. Costa Rica: Irazu, Caché. Indian River, Fla.; end of March (Palmer) Georgia, last of July (Abbot). Three broods in Florida (Palmer).

"The first brood comes out early in the Spring (in Florida) and a succession of generations continue until stopped by cool weather" (Quaintance).

"*Caterpillar.*—Last stage. Head of liver color, on each side of the ocelli a red spot; mandibles black. Collar black, the first ring below and on the sides of minium color. The general color of the body is glaucous with little green spots and with black points on the superior part of the stigmata which are dark orange-red. The dorsal line is black, on the superior sides of the body is an orange longitudinal band, becoming red behind, where the two are joined over the anal plate. The horny legs are dark brown externally, the fleshy legs are orange colored. Gundlach" (Scudder).

"*Chrysalis.*—Dark brown according to Wittfeld; when dried, fusco-luteous beneath, above mahogany colored, more or less tinged with luteo-olivaceous, shining throughout; hairs of the head as well as the scant hairs of the rest of the body luteous; the bristles of the pro-thoracic spiracles luteo-fuliginous; the posterior lip of the spiracle itself piceous; mesothorax faintly striate in irregular, transverse, wavy, somewhat tortuous, distant lines. Abdominal segments sparsely irregularly, and rather finely punctuate, the punctures fuscous. Cremaster dark fusco-castaneous. Length, 22.5 mm.; width of head, 5.25 mm.; of mesothorax, 6.5 mm.; of abdomen, 7.5 mm.; length of cremaster, 2.25 mm." (Scudder).

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"*Caterpillar.*—Last stage. Length about 3 cm. (1.17 in.); width of head, 4.5 mm.; width across third segment, 5 mm. (.195 in.). Slope of body somewhat fusiform, thickest about the middle, and tapering slightly at each end. Head somewhat cordate in shape, quite large. Color yellowish, sprinkled with black; lighter below, without black markings. The lateral yellow lines of the preceding stages more orange colored. Narrow dorsal line present. Two broken rings of orange on prolegs. Head with the usual orange spots near the base of mandibles; the apical third of head rufous, the rest black. Prothoracic shield black, ventral portion of this segment dark red. Thoracic legs black; head greatly constricted behind, forming a narrow neck. Body and head covered with numerous short, light colored hairs.

"*Chrysalis.*—Length about 2.25 cm. (.877 in.); width about 6 mm. (.234 in.). At first greenish-yellow in color, particularly the wings and thorax; at length, shining brown in color; eyes brownish-black. In the course of two or three days the pupa becomes covered with a floculent excretion. The cremaster consists of numerous brown hairs with curved tips, forming hooks" (Quaintance).

The caterpillar feeds on *Wistaria frutescens*, *Desmodium viridiflorum*, *Phaseolus perennis*, *Clitoria mariana*, *Clitoria ternatea*. In the South also feeds on Cruciferæ—beans, turnips, cabbage.

Eudamus (Thymele) simplicius Stoll, Suppl. Cram., pl. 39, figs. 6, 6 E, 1791; Godm.-Salv., Biol. Rhoph., 270, Tab. 75, f. 1 ♂.

Expands $1\frac{13}{16}$ inch. Upperside brown; immaculate in some specimens; tails to the hind wings $\frac{9}{16}$ inch in length. In other specimens on the primaries there is a line of spots extending from the costa across the wing toward the inner angle and ending at the third median nerve. This line is formed of, first two small spots on costa, a long one at end of cell; then a triangular small one, then another long one, and lastly a point just beyond third median nerve; there are sometimes three and sometimes four subapical spots. Underside.—Primaries show the spot above when they are present. Secondaries have two parallel, dark brown bands extending across the wing from the costa to the inner margin.

This species comes near to *E. eurycles* Latr., and Godman and Salvin, in the Biologia, say: "The male in *simplicius* has a costal fold to the primaries, and this is a character separating it at once from *eurycles* whatever the definition of the transverse band of the former may be. Females of the two species can usually be distinguished by the outer margin

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of the secondaries in *simplicius* being more rounded and forming an angle rather than a curve where the tail commences."

Habitat.—Texas; Arizona; Mexico; Central America; South America to Paraguay.

Eudamus (Goniurus) eurycles Latr., Enc. Meth., p. 730, 1823.

Primaries dark brown, with four subapical costal spots; a narrow transvere diaphanous fascia extends across the wing from the costa to near the angle, broken into seven spots or sections by the nervures. Secondaries immaculate. Primaries on underside are the same as above. Secondaries beneath with a basal fuscous quadrate spot, a central broken fascia and an unbroken larger fascia, submarginal. The secondaries are tailed. No costal fold in the male. The diaphanous markings of primaries may be absent.

Habitat.—Texas; Arizona; Mexico; Central and South America.

We do not appear to have any authentic records for this species in the United States. It has probably been confused with *simplicius*.

Eudamus (Goniurus) albofasciatus Hew.

"Description of One Hundred New Species of Hesperidæ." By W. C. Hewitson. Part I. London, 1867.

Biologia, p. 280, pl. 75, fig. 11, Gent.

Upperside dark brown. Anterior wing with eight transparent spots; four forming a central band (the lowest spot very minute), one outside of these and three in a band before the apex. Posterior wing with a very long tail. Underside.—Anterior wing as above, except that it is gray near the apex and marked by a triangular dark brown spot. Posterior wing dark brown, crossed obliquely by a central band of white; a submarginal band of gray. Expansion 2 inches.

Habitat.—Guatemala (Polochic Valley); Texas; Arizona; Mexico; Nicaragua: Costa Rica.

Food plant unknown.

The long tails and broad white band of the species are very conspicuous.

Huachuca Mts., Arizona, August, Carr Cañyon (Skinner).

Eudamus (Goniurus) dorantes Stoll, Suppl. Cram., Pap. Ex., p. 172, t. 39, f. 9.

Protillus Herr.-Sch., Prodr., p. 36.

Amissus Hew., Derc. Hesp., p. 5; Ex. Butt. Eud., 2, f, 10.

"Expands $1\frac{13}{16}$ inch. Color dark brown with tails to the hind wings

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$\frac{7}{16}$ inch in length. Primaries are marked with nine translucent spots; three subapical; one at end of cell and a minute one above it on costa; four in the disc divided as follows: one minute point, and below it and toward base a larger hour-glass shaped spot; next below and still nearer base a rectangular spot; below this and toward exterior margin a small nearly quadrate spot. Inferiors immaculate but edges crenate, with dark extending into the lighter fringes. Underside.—On primaries the spots are all repeated. Secondaries have two parallel more or less broken bands extending from costa to near inner margin.

Var. **rauterbergi** Skinner, Ent. News, 6, 113, 1895.

♂. Expands one and three-fourths inch. Uppperside.—Dark smoky-brown in color; superiors have the nine hyaline spots, a faint one on middle of costa, and three extending in a line between this and the inner angle; one in middle of disc and a faint one in the interspace above; these are close together below the costa on the outer third of wing. Inferiors immaculate, with tails a half inch in length. Fringes alternating black and cinereous. Underside.—Superiors as above. Inferiors grayish with black longitudinal bands. This form is smaller and very much darker than *protillus;* the fringes are far less marked, and the tails lack the admixture of light hairs; the maculation is about the same as in the species.

Habitat.—Texas and Arizona; Mexico; Central America; South America.

One specimen from Mr. F. Rauterberg, who received it from Comal County, Texas. I have also seen a specimen belonging to Dr. Wm. Barnes taken in Arizona.

Records.—Carr Cañyon, Huachuca Mts., Arizona, October 19th (C. R, Biederman).

Erycides (Phocides) urania West.-Hew., Gen. Diur. Lep., 510, pl. 79, fig. 1, 1852.

Erycides texana Scudder, Rep. Peab. Ac. Sc., 4, 67, 1872.

Phocides urania Godmn.-Salvin, Biol. Cent.-Amer., Tab. 76, f. 22 ♂ gent. Aaron, Ent. News, 1, 23, 1890; Skinner, Ent. News, 2, 101, 1891, pl.

"Expanse 2 to 2⅜ inches. Ground color above black on both wings; banded and spotted with bright green on blue. On the primaries this banding in most examples is caused by the fact that nearly the whole surface is covered with a dense coat of scales of bright green, which being separated by the black bordered nervures, take on the form of longitudinal bands: in a few specimens, however, the apical area is but slightly sprinkled with green, and the whole outer half of the wing appears black or nearly so. A group of translucent subapical spots consists of three constricted points along the costal margin, one larger

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below the outer of the three, and a much larger quadrate spot centrally below the fourth. Two translucent bands follow these spots internally, the first bifid, short, hardly more than an elongated spot, the inner one crossing the median area much longer and made trifid by two nervures. The color of the markings on the secondaries is much brighter; and towards the anal angle of a deep azure-blue tint in some examples. From the base three streaks diverge towards and stop abruptly on the median area, the upper of these is shorter than the others to make room for the bifurcate series of spots on the outer area of the wing. These spots, four in the inner line and seven in the outer, are placed in the form of a written letter Y. On some examples there is a faint indication of another streak, longer than the three others running parallel to the abdominal margin. Beneath, color and markings a reproduction of the upper surface, save that while the black is not so dense on the primaries, it is deeper and more velvety on the secondaries. The green atoms on the primaries are fewer; on the secondaries they are brighter, and the bands run all the way to the costal edge. Thorax above black, with tufts of green hairs and annulations of the same color. Head and palpi above green spotted, with white. Antennæ black, dark cinereous at tip. Emarginations, above and below, notched, white."

Habitat.—Texas; Mexico; Central America.

Erycides (Phocides) lilea Reak.

Erycides lilea Reakirt, Proc. Acad. Nat. Sci., Phila., 18, 339, 1866; Biol. Cent.-Am., 2, 296, t. 76, f. 23, 24, 1893.

Erycides sanguinea Scudder, Syst. Rev. Am. But., 47, 1872.

"Upper surface shining blue-black, irrorated with lustrous green particles over the basal area and the body; a large fulvous red costal spot on the primaries cut by the subcostal vein; outer margin of both wings, including the anal angle of secondaries, fringed with white hairs, especially long upon the latter. Underneath as above, but destitute of the green irrorations. Expanse 2.25 inches. Body blue-black, the palpi, excepting the terminal joint and a collar, fulvous-red; antennæ black. Var *a.*; the abdominal margin is fringed with dark brown hairs. encroaching slightly upon the white anal ailiæ."

Habitat.—Mexico, near Vera Cruz, W. H. Edwards. A local race of the well-known *Erycides palæmon.* Texas (Captain Pope, Mexican Boundary Survey); Mexico; Guatemala; Costa Rica.

Eudamus (Phocides) (Erycides) batabano Lucas; Sagra, Hist. Cuba, 7, 624, 1856.

"E. alis læviter subprolongatis utrinque fuscis, anticis ad basin nitido-caeruleis, posticis duabus lineis transversalibus versus basin

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eujusdem coloris; abdomine nitedo—cærulus annulato. Envergure (femelle 61 mm.)."

"*Male.*—Expands 2.3 inches. Upperside deep smoky brown, with a pronounced indigo-violet reflection. Primaries without markings, other than a few scattering, blue or green scales about base of wings. Fringes concolorous. Secondaries with a row of brilliant blue or green elongated submarginal spots, more or less confluent, interrupted by the veins, and becoming obsolete toward anterior margin, fringes with some white in intervenular spaces. Beneath, primaries paler and with a purplish cast, a few blue or green scales along costa, about base and near inner angle of wing. Secondaries much like upperside, but deeper. The purplish reflection at anterior margin gradually changing to a deep indigo as it approaches the abdominal fold; a few blue or green scales in median space and along abdominal margin, submarginal spots as above but brighter. The female expands 2.6 inches. Upperside paler than male, gradually growing deeper over both wings until nearly black at anal angle; all wings with a faint purplish reflection in certain lights. Markings on secondaries like those of the male. Beneath differing from the male only in the paler color and in having a purple reflection, which is more pronounced on upper surface. Body deep brown above and below, some blue or green lines on collar, front and shoulders, and arranged in bands on posterior segments of abdomen. Palpi greenish white. Antennæ dark brown."

Dyar, Can. Ent., 22, 211, 1890 (Life History).

Habitat.—Florida; Cuba.

Records.—Miami, Florida.

Eudamus (Acolastus) (Erycides) amyntas Fab.

Erycides amyntas Fabricus, Syst. Ent., p. 533, 1775.

E. savignyi Latreille, Enc. Meth., 9, 741, 1823.

"Alis subcaudatis, fuscis, fenestrati maculatis; posticis subtus puncto baseos atro. Antennæ unicinate, apice subferruginæ. Alae posticae supra immaculatae, subtus glaucae, fasciistribus obscurioribus et puncto distincto atro ad basin. Habitat in America."

"Expanse of wings 2 inches. Upper surface dark brown, almost black, with a strong purple reflection. A little beyond the middle of cell of fore wings is a white hyaline bar extending across the cell, emarginate externally. Below this and a little further out, in the second median interspace, is a similar but larger subquadrangular spot, and in the first median interspace is another, more oblong in shape. The first two of these three spots represent two of the four spots which form the median oblique band of *Eudamus tityrus* and allied species. Near the apex there is an oblique row of these anteapical small spots, subquadrate in form, the first the smallest. Hind wings without spots. Fringes fuscous, those of the fore wings darkest; the anal angle some-

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what produced. the underside has the spots of the upper surface of fore wings repeated. The surface along the costa, a broad apical portion and external margin of fore wings, and all of the hind wings, except two bands of spots and the anal angle, rich purple, not very dark; all the rest of the surface dark brown. The dark brown portion consists of two transverse bands, marking nearly the division of the wings into thirds, and a basal portion of the anal angle. Body black; palpi and underside of head gray."

Habitat.—Florida; Arizona; Mexico; Central America; Antilles.

Records.—Key West, Fla., January; Miami, Fla., January; Phœnix, Florence, Arizona, September 3rd (C. R. Biederman); Dyar, Ent. News, 8, 182, 1897 (Life History).

Eudamus (Erycides) (Pyrrhopyge) araxes Hew.

Erycides araxes Hewitson, Descrip. 100 New Species of Hesp., Part 1, page 2, No. 3.

"Upperside dark brown, the fringe snow-white, intersected with dark brown. Anterior wing with ten transparent white spots; three forming a central transverse band, three outside of these forming a short oblique band, three before the apex, and the tenth a minute spot at the costal margin. Underside dark brown. Anterior wing as above, except that it is rufous at the base. Posterior wing with the base and inner margin and two transverse bands orange-yellow. The first band before the middle, regular and trifid; the outer band beyond the middle curved outwards, undulated and composed of several spots. Expanse 2 inches. Habitat Mexico. In the collection of W. C. Hewitson. Like species of *Eudamus* in general appearance, but with the antennæ of this genus."

The Biologia says: "Hewitson's description of the species was based on a Mexican specimen now in the collection of the British Museum. Our Mexican series of examples agrees generally with the type, though there is a considerable amount of variation as regards the definition of the markings of the secondaries. In Arizona specimens these marks are evanescent, and the dark outer border is not clearly defined on its inner edge. The difference is sufficient to constitute a distinct race. Plotz also recognized two forms, but unfortunately gave a new name *cyrillus* to the true *araxes*, the Arizona form being his *araxes*. To rectify this we propose to call the northern insect *Pyrrhopyge*

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arizonæ, specimens of both sexes being in our collection sent us by Morrison from the neighborhood of Fort Grant."

Habitat.—Arizona.

Records.—Carr Cañyon, Huachuca Mts. Arizona, September 29th and August 15th (Skinner).

Godman and Salvin in the Biologia Centrali-Americana propose the name *Pyrrhopyge arizonæ* for the Arizona form based on specimens sent by Morrison, the markings on the underside of secondaries being evanescent. This is true of all the specimens from Arizona that I have examined, none of them showing the distinctive markings of the figure in the Biologia of *araxes* (Pl. 73, f. 15).

MEGATHYMUS Scud., Rep. Peab. Acad. Sci., iv, 83, 1872.

Megathymus yuccæ Bd.-Lec., pl. 70, 1833.*

"Expense of wings from 2.5 to 3 inches. *Male.*—Upper surface deep umber-brown, the base of both wings tinged with yellow, the markings yellow. The fore wings have a large spot in the outer end of the cell that is subquadrate; above this in the interspaces are three small spots in an oblique line, but little more than mere dots. Beyond these is a submarginal row of spots which begin in the usual line of anteapical spots about four-fifths of the distance from the base to the apex, but the two spots opposite the cell are nearer the outer margin, and from these they gradually run till the last one is close to the posterior angle. The first of the four anteapical spots is a mere dot, the next three are a little longer than wide, the fifth and sixth are narrow but reaching from vein to vein, the seventh and eighth are in the median interspaces, and the ninth is above the submedian. The last three are somewhat irregularly convex on the inner side, but less so on the outer. Hind wings without spots, but with a yellow washing along the outer margin. Underside deep brown, like the upper, but brighter, the outer portion of both wings pearly gray, with a patch of the same color on the middle of the costa of the hind wings, and a white crescent below it, and the same scales sprinkled along the inner margin and the faint streaks through the wings. The spots of forewings are repeated, but somewhat enlarged, the color paler yellow, whitish in the costal region. *Female.*—The general color and markings of the fore wings as in the male, but much larger. The spot in the cell extends from vein to vein, and inward along the median a little way toward the base, the three spots above nearly as long as the spot in the cell is

* Riley, Tr. Ac. Sci. St. Louis, 323–344, 1876; id., 8th Mo. Ent. Rep., 169, 1876; id., 9th Mo. Ent. Rep., 129, 1877.

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wide. Besides the much enlarged anteapical spots, which are paler yellow than the other spots, there are three oblique pale yellow spots on the costa before the apex. The lower three spots of the submarginal band are widened, so that the inner upper corner almost reaches the cell. Hind wings, besides the yellow scales along the margin, have a discal row of four small spots reaching either margin. Underside as in the male, except that the spots are prominent, and the spots near the costa of the fore wings are more washed with white."

Habitat.—From South Carolina to the Gulf of Mexico.

Var. **coloradensis** Riley, Tr. Acad. Sci. St. Louis, 3, 566, 568, 1877.

"This Colorado form is remarkable for its small size and the paleness of its colors compared with those reared farther South on the larger leaved, more luxuriant Yuccas. It is also distinguised by a second narrow white line on the underside of secondaries just outside the larger triangular white spot from costal vein; also by the dark spots on this underside of secondaries, generally having a white pupil, a tendency thereto being noticeable in the Carolina specimens."

Habitat.—Colorado. Larva feeds on ? *Yucca angustifolia.*

Larva feeds on *Yucca aloifolia*, *gloriosa* and *filamentosa*, burrowing in the stems and roots.

Megathymus cofaqui Strecker, Proc. Acad. Nat. Sci., Phila., 28, 148, 1876; Streck., Lep. Rhop. Het., pl. 15, f. 2.

"*Female.*—Expands two and one-sixth inches. Head dark brown; palpi whitish; thorax brown, mixed with hoary, posterior half, above clothed with yellowish hair; abdomen brown; antennæ black above, white beneath, terminations black. Upper surface of wings blackish brown. Primaries with an exceeding irregular, bright, deep yellow band extending from vein one to the subcostal nervure; the outer edge of this band is rather regular from veins one to four, though further removed from the extreme margin at the latter than at the former; from veins one to two it is narrow, from veins two to four it is nearly three times as broad, extending to where vein three joins the median vein, the balance of it is within the discoidal cell and is narrow, of about the same width as it is between veins one and two; the portion of this nearest the costa is paler in color than the rest. Between veins four and six, exterior to this band is a mark composed of two small almost connected yellow spots. Interior to these, between veins six and nine, is a narrow yellowish-white mark. Midway between the inner edge of the large yellow band and the base of wing, and between

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veins one and two, nearest the latter, is a roundish yellow spot. Inner half of base covered with rich yellow hair. Fringe yellowish-white, alternated with dark brown at terminations of veins. Secondaries.—Basal third, especially in inner part, heavily clothed with rich yellow hair and scales, a band of four yellowish spots, separated only by the veins, cross the wing beyond the middle; from this band toward the costa, opposite the apex, is another quite yellow spot, which is succeeded by a larger one near the costa, nearly midway between the apex and base of wing. Outer margin between the veins yellow, forming patches more or less triangular, with the points inwards. Fringe yellowish-white. Under surface.—Primaries brown, not so dark as above, and shaded at outer margin and apex with hoary; no yellow at base of wings. Markings as above, excepting that the yellow band is continued from its lower end to, and connected with the yellow spot between it and the base, and between veins one and two. Secondaries. —Hoary or whitish-gray. dark brown along costa, especially towards the base. Towards anal angle a fine white spot, corresponding in position with the first of the series of four that compose the yellow band of upperside; each of the remaining yellow spots of upper surface and the next one of the two, between them and the costa, is represented by a small dark brown spot, or rather row of continuous spots; the last towards the costa is replaced by one of pure white; half way between this latter spot and the base is another white spot, and also one in the discoidal cell, from which a dark brown line extends to near the abdominal margin. Fringes white and brown. Locality Georgia. One specimen."

Habitat.—Georgia; Florida.

Records.—St. Augustine, Florida (C. W. Johnson); Tifton, Georgia, September 11th (G. R. Pilate).

Megathymus streckeri Skinner, Can. Ent., 27, 179, 1895.
Cofaqui ♂ Strecker, Br. Bull., 3, 66, 1880.

"*Male.*—Expands from two and three-quarters inch to three inches. Upperside.—Superiors rich brown, but not as bright, nor has the brown as much red in it as *yuccæ*. There are three subapical white spots; a lemon-yellow spot at end of cell; there is a row of five yellow spots running across the wing, parallel with the exterior margin; the upper two are small and square in shape; the lower three are small and triangular, and there is one in each of the three median interspaces. The inferiors have a yellow marginal border about one-eighth of an inch in width, the wing being otherwise immaculate, and is clothed with long silky brown hair. Underside.—Superiors have the spots repeated. Inferiors are gray, with a varying number of small white spots—one specimen having two and the other five. The female is larger and has the same number of spots as the male; the three

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subapical spots white and the remainder yellow; in the female the five spots on the wing are in two series, the two upper being nearer the exterior margin, and the three lower are nearer the base; in other words, they do not form a continuous line as in the male. This species has been confounded in collections with *cofaqui* Strecker, which was described from a female. The male of *cofaqui* is marked practically like the female, but the male has the long hair on the inferiors as in *streckeri*. This long hair is also conspicuous in *streckeri* at the base of the superiors below. This fine species is described from two males in my own collection; one is from Texas and the other probably from Arizona, the exact locality not being known in either case, and a pair in the collection of Dr. Herman Strecker of Reading, Pa. One of these is from Texas and was collected by the late Jacob Boll and the other from the San Juan reconnaissance, made under the charge of Lieut. Ruffner, Colorado, in 1877."

Habitat.—Arizona; Texas; Colorado.

Records.—Durango, Colorado, May 30th (Oslar), June 7th (Oslar); Texas, April 4th, 1884; Highrolls, New Mexico, June 12th (H. L. Viereck).

Megathymus ursus Poling, Ent. News, 13, 4, 1902, pl. 4.

"♀. Expanse 3½ inches. Primaries above brown with three subcostal yellowish-white spots and a band of five large orange spots extending from these to near the internal margin; a spot of the same color near the end of the cell. On the primaries beneath these markings are repeated. Secondaries above immaculate, fringes white. Beneath, there are two white spots on the costa and four small white spots in a line below the central area of the wing."

Habitat.—Pima County, Arizona. The author of the species expresses the opinion that this is the female of *neumoegeni*. I have not seen the species. It may be readily known from the excellent colored figure in *Entomological News*. It looks to me like a large female of *streckeri*.

Megathymus smithii Druce, Biol. Cent.-Am. Het., 2, 320, 1896, pl. 69, f 5 ♂.

"*Male.*—Primaries and secondaries dark brown; the primaries with a small spot at the end of the cell, three spots beyond it on the costal margin near the apex, and a submarginal row of small spots extending almost to the anal angle, the cell pale yellow, fringe alternately pale yellow and brown; secondaries with a submarginal row of rather indistinct yellow spots extending from near the apex to the anal angle, the fringe white; the underside of the primaries brown, with the spots as above, but larger and whiter, that of the secondaries

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brown, broadly bordered with gray from the base to the anal angle, and with two zigzag white lines crossing from the costal to the inner margin; head, thorax and abdomen dark brown, the underside of the palpi and part of that of the thorax white; antennæ brown above, white beneath, the tip black. Expanse 2½ inches."

Habitat. — Texas (auct. Dr. Wm. Barnes); Amula in Guerrero, Mexico, 6000 feet (H. H. Smith).

Megathymus neumoegeni Edwards, Papilio, 2, 27, 1882.

"*Male.*—Expands two inches. Upperside black and orange-fulvous; costal margin brown; along the hind margin of both wings a broad black band, erose within and opposite cell on primaries incised; on costal margin, beyond cell, a black patch which extends to median nervure, and there connects with a large patch which occupies most of the disk; between this and the border a broad orange-fulvous band from margin to margin, but restricted opposite cell; on costa a fulvous patch anterior to the black one; the basal area darker fulvous. Secondaries have the disk black, much concealed by long fulvous hairs, and between this and the border a light band as on primaries; fringes alternately fuscous and sordid white, white prevailing on posterior half of secondaries. Underside of primaries dark brown at base and on posterior half of wing quite to hind margin, the apex densely sprinkled with gray-white scales; orange repeated, but above median replaced by white; the patch on costa repeated. Secondaries brown, wholly sprinkled with gray-white scales, most densely beyond disk, and this area is somewhat clouded. A small white spot near base below subcostal, otherwise immaculate. Body brown; beneath thorax gray-white, shading toward abdomen into gray-brown; legs reddish-brown, with many gray scales and hairs; palpi white; antennæ brown above, whitish below, tip dark ferruginous.

Female.—Expands 2.2 inches. Legs black, more orange fulvous; the borders as in the male; in one example the black patches are nearly as in the male, but in the other they are greatly reduced. In this last one, on underside of primaries, the orange band is broad and bifid, embracing the costal patch; secondaries in addition to the white spot near base, have a white patch, a cluster of white scales, denser than elsewhere, near the inner angle. From one male and two females taken in Southern Arizona. Another female was taken making four examples. They are described as sitting in the sunlight on leaves of agave and flying when disturbed to adjoining cliffs of rocks, alighting generally out of reach of the net."

Habitat.—S. Arizona; N. Sonora. Mexico.

"About ten miles from Prescott, Arizona, Mr. Jacob Doll noticed a rocky cliff rising sheer from the roadside, and high

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up on its side some butterflies dancing about. He climbed slowly up, about thirty feet, and captured a specimen in his net, only to find its wings utterly despoiled when he took it from his net upon descending. On the following day he revisited the spot, having arranged a heavy pad of cloth about the neck of a killing bottle so that it would not be broken when suddenly pressed against the rock. Slowly he climbed up the sides of the cliff, and after two hours hard work had 'bottled' seven specimens of this beautiful species, which were sitting on the bare rocks, but, oh, so shy!" (R. Ottolengui in Ent. News, 6, 218, 1895).

Var. **aryxna** Dyar, Jour. N. Y. Ent. Soc., 13, 141, 1905; Biol. Cent.-Am. Lep. Het., 3, pl. 69, figs. 3, 4.

Dr. Dyar says, "It differs from *neumoegeni* in having the fulvous markings considerably reduced, the outer band being broken into spots. I have ten specimens from Arizona from Dr. Barnes and Mr. Riley." Dr. Dyar says his *aryxna* is figured in the Biologia, plate 79, figs. 3 and 4. Figure 4 I take to be *neumoegeni* ♂, and figure 3 is a species not known to me. Figure 4 is the species or form commonly found in the Huachuca Mts., Arizona. For figure 3 I propose the name *drucei*. *Neumoegeni* is quite variable, the fulvous markings being broad bands or reduced almost to spots.

Megathymus polingi Skinner, Ent. News, 16, 232, 1905.

♂. Head above gray, below white; antennæ black, with a few white scales at the joints and white at the base of the club; body above orange-fulvous, gray beneath. Primaries.—Black and orange-fulvous, with a black border to the exterior margin evident at the apex; on the orange-fulvous inside of this border is a black spot of irregular shape; in the centre of the wing is another black spot irregularly round in shape; the base of the wing is orange-fulvous. Secondaries. —Border black; there is an orange-fulvous band which starts below the costa and extends nearly to the interior margin; the base is orange-fulvous. Underside.—Primaries: These are much as above, except that the upper part of the orange-fulvous band is white. Secondaries. —Gray, with an irregular whitish band parallel to the costa and exterior margin; it begins as a spot and then narrows into a line and then gradually widens in an irregular way; in the centre of the wing are two whitish spots, the lower one much the longer of the two. Ex-

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panse 44 mm. The female is a trifle larger, but the markings are the same. This species is allied to *neumoegeni* Edw., but is smaller and may be differentiated at once by the white band on secondaries below.

Described from one male and one female, sent by Mr. O. C. Poling. They were part of a series taken in the Baboquivari Mountains, Pima County, Ariz., October 15th to 30th.

Grais stigmaticus Mabille, Bull. Soc. Ent. Belg., p. 54, 1883; Biol. Cent.-Am., 2. 381, 1894, pl. 84, figs. 24, 25, 26.

"Olivaceous-fuscous; on the anterior wings a blackish antemarginal line, or rather a small streak, sinuate and formed out of separate spots. In the cell two fuscous spots. External margin of the wings sinuate. The posterior wings present three obscure interrupted lines. The fusco-ochraceous lower surface presents the same lines distinctly formed out of black points. Body fuscous. Pectus hairy white, feet and palpi ochraceous. Brazil. This speceies is of a clear olive-brown, and the dark lines which traverse the fore wings lengthwise are but little marked and almost absorbed on the ground color. The palpi are of an ochraceous yellow, and this color is continued to the breast."

Habitat.—Kerrville, Texas; Mexico; Central America; South America; Jamaica; Victoria, Tamaulipas, Mexico, July.

ADDENDA.

Eudamus electra Lintner, turns out to be an exotic species. It was described about thirty years ago and has been a puzzle to everyone. While on a recent visit to the Carnegie Museum in Pittsburgh I saw the unique type of *electra* and at once recognized it as not belonging to our Boreal fauna and also that it was not an aberration of any of our known species. On looking over some of the other material in the Museum I noticed a female Hesperid from the Godman collection bearing the name *Ephyriades zephodes* Hubner. I saw at once that *electra* was evidently the male *zephodes*. We have two specimens of the species in the collection of the Academy bearing the name *Nisoniades zephodes*. One specimen does not have any locality label and the other was taken at Samana Bay, San Domingo, June 17, 1883, by Dr. W. L. Abbott.

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Mabille in the Genera Insectorum places *zephodes* Hubn. and *clericus* Fabr. as synonyms of *otreus* Cramer. In this he may be correct but the figure of *otreus* (Cramer, Pap. Exot., fig. 328) is very crude, and the figure of *zephodes* (Hubn. Samml. Exot. Schmett.) is excellent. It is not certain that they are identical. America meridian is given as the habitat by Mabille.

The specimen of *electra* is a very fresh one and probably came from a chrysalis near where it was found. How the species got to Canada we can only conjecture, the most likely way being on fruit (bananas) as larva or chrysalis.

To the names in *Megathymus* should be added *M. yuccæ* var. *navajo* Skinner, described in the July number of Entomological News for the present year. It is found near Fort Wingate, New Mexico. It is like *yuccæ* and *yuccæ coloradensis* except that it is black in color.

Erycides amyntas arizonensis n. var. Same size and with the same translucent spots in primaries as in *amyntas*, but the ground color of the wings is of a much lighter color. There is a submarginal band of spots on the secondaries and an inner band (or large spot) in the discal area. On the underside the ground color is also much lighter than in *amyntas*, and the two bands across the secondaries are markedly differentiated from the background. This is a pale desert form apparently. Described from a number of specimens from Florence, Arizona, taken September 3rd (C. R. Biederman).

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The Boreal American Species of CHLORIPPE (Doxocopa, Apatura) Lepidoptera.

BY HENRY SKINNER, M. D., SC. D.

The species of *Chlorippe* found in America north of Mexico can readily be divided into two distinct groups by the character of the markings. They may be called the CELTIS GROUP and the CLYTON GROUP.

The CELTIS GROUP is characterized by having one or more ocelli on the primary wings and a number of white spots. The CLYTON GROUP never has ocelli on the primaries and seldom if ever any pure white spots.

In the CELTIS GROUP there is a black spot, sometimes an ocellus, on the inner margin of the underside of the secondaries, about half-way from the base to the angle of the wing. In some cases it is a mere point, but in other specimens or species an oblong ocellus. This spot is never found in the members of the CLYTON GROUP.

According to our lists and catalogues the names falling in the first or CELTIS GROUP would be *celtis*, *antonia*, *montis*, *leilia*, *cocles*, *alicia*. In the CLYTON GROUP, *clyton*, *proserpina*, *ocellata*, *nig*, *flora*. In the CELTIS GROUP, *celtis* and *alicia* may be separated from the remainder owing to the fact that there is a single *ocellus* on the primaries above the third median nervule. *Alicia* is larger than *celtis* and the color is reddish tawny and all the spots and markings are relatively larger. *Antonia* has two ocelli on the upperside of the primaries and three on the underside. It also has three fuscous spots in the discoidal cell on upperside of primaries. *Leilia* is redder than any other in the group (reddish chestnut) and has two ocelli, but only two fuscous spots in the discoidal cell, and these spots are separated by a comparatively light colored area or spot. *Leilia* is a small form from Sonora, Mexico, and Arizona. The hind wings are somewhat lengthened and concave or excavated on the outer margin. *Montis* is only slightly different from the Texan

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antonia and is found in Colorado. It is lighter in color in some specimens and is only a mountain mutation. The type of *cocles* Lintner is a female, and the collections from whence it came were made at Brownsville, Texas, April 1st to 10th; Hidalgo, Texas, April 17th to May 10th; Lomita Ranch, April 14th to May 20th. The latter place is sixty-five miles from Brownsville and seven miles from Hidalgo. We possess the type of *cocles* and four other specimens, all females. One from Arizona (H. K. Morrison, 1883) and three from Round Mountain, Blanco County, Texas, June 29th to 31st (F. C. Schaupp). *Cocles*, I believe, is the female of *antonia*. The specimens of *antonia* in our collection bear the following data labels; Brunet County, Texas, April 25th; Round Mountain, Texas, June 25th, August 14th, October 15th. Also three specimens from fifty miles North and West of Corpus Christi (S. F. Aaron). These specimens are mentioned in Papilio 4, 172, 1884. I am of the opinion that *cocles* is the female of *antonia* because all the specimens I have seen are females, and all the male specimens from the same general locality are *antonia*. Mr. Edwards in his description of *antonia* says, "the species is found in Texas and Arizona. I have received several examples from Boll and Belfrage."

Karl R. Coolidge (Pomona College Journal of Ent., 3, 511, 1911) quotes Aaron and considers *cocles* a synonym of *leilia*. He also considers *antonia* a synonym of *leilia*. This may be true enough if we accept Mr. Coolidge's idea as to what constitutes a species. We are trying to elucidate what nature means by gradation and variation and solve interesting biological problems. These butterflies are distinctly different in appearance and markings, and even though they do intergrade the extremes should have distinctive names. The word species has entirely lost its meaning since the acceptance of the doctrine of evolution. If we put into the synonmy all forms that intergrade we would have very few names of species left and we would not add to the solution of the biological problems involved. On the other hand, I would not have these remarks taken as a license for the

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description of slight or intangible variations that would make it impossible for students to unravel their author's meaning.

Leilia is a pretty form or variety. The types were two males taken by Mr. Henshaw, of Lieutenant Wheeler's Exploring Expedition, August, 1874, at Camp Lowell and in the Sonoto Valley, Arizona. It is well figured in the "Butterflies of North America," 2, pl. 1. The figure in Dr. Holland's Butterfly Book is more properly the Arizona form of *antonia*, at least from a nomenclatorial standpoint (Pl. 23, fig. 11). Our series of *leilia* are from Sonora and Arizona, taken in 1883 by Morrison. Three specimens like Dr. Holland's figure of *leilia* were taken at Mt. Graham by Morrison in 1882.

The types of *alicia* were from New Orleans, Louisiana. All our specimens are from Florida, and those that bear any more than a State label were taken by Dr. Wittfeld at Georgiana on the Indian River.

Celtis occurs in the southern half of the United States, east of the Great Plains. Riley says the butterflies appear in eastern Missouri by the middle of June, and that there is a second brood in August. In West Virginia they appear the end of May (Edwards). It has been recorded from as far north as Massachusetts. In New Mexico it is replaced by *antonia* and *leilia*. Our series of specimens are from Kentucky, Tennessee and Texas. The Tennessee specimens were taken at Nashville, June 13th to 24th, and the Texan examples at Black Jack Springs, July 19th

The *clyton* group is not so complicated and the forms or varieties are fewer. The figure of the species given by Boisduval and Le Conte is a rather poor one, the coloring being rather crude. The figure given by Mr. Edwards under the name var. *ocellata* in his Butterflies of North America, 2, I consider to represent the species and may be taken as typical *clyton*. I do not see any reason for the name *ocellata* he gives it. Variety *proserpina* Scudder has the hind wings much darker and the maculation almost obscured. This is well illustrated on the same plate (figs. 5, 6). Strecker in

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his Catl. Butts. N. Am. proposes the name *nig* for a variety which he says has "all the wings obscured with blackish, ocelli obsolete."

The type of *flora* Edwards, came from Palatka, Florida. It was also taken by Dr. Wittfeld at Georgiana (Indian River), Florida. It is lighter in color than *clyton*, being bright orange-ferruginous. It is figured in Edwards' Butts. Nth. Amer., 3, pl. 1, Apatura. I do not consider it more than a topomorph.

There is a form of *clyton* found in Texas that appears to be worthy of a varietal name. I have had it sent to me for identification, especially the female. As it causes confusion and collectors do not seem to be able to make it fit any of the described forms, a name for it seems desirable. I propose the name *texana*.

The male expands 46 mm. Primaries buff (orange-ferruginous). There is an outer row of four small, round, yellowish white spots and an inner row of seven spots of the same character but somewhat larger on the primaries. The secondaries are the same color with the usual six black dots. These spots are repeated below and are quite small as compared with those of *flora*. The primaries are practically devoid of black or fuscous and the secondaries also, except the spots. The female expands 60 mm. and is the same color as the male. The maculation on the primaries and secondaries is like that of the male except that the spots are relatively larger, and those of the primaries not so white or distinctly defined. The male type was taken at Round Mountain, Texas, July 31, 1895, by F. G. Schaupp, and the female near Corpus Christi by S. F. Aaron (see Papilio, 4, 179, 1884). We have a number of specimens taken in Brunet County, Texas, April 24th, that are likely the first generation of *texana*. They are much darker in color; the spots in the primaries are white or whitish like those in *texana*. This is probably the form Aaron speaks of as *flora* Edw.

The species or forms in this genus are rare in collections and many of them lack proper data. Additional material from many localities, with accurate data and a knowledge of

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the life histories will enable the butterflies to be placed more accurately as to their relative standing, but at present I would consider that we have but two species and arrange the other names as varieties or topomorphs as follows:

CELTIS GROUP.	CLYTON GROUP.
Celtis *Bd.*	Clyton *Bd.-Lec.*
var. antonia *Edw.*	*ocellata* Edw.
cocles Lint.	var. proserpina *Scud.*
montis Edw.	var. nig *Strecker.*
var. leilia *Edw.*	var. flora *Edw.*
var. alicia *Edw.*	var. texana *Skinner.*

With one or more ocelli on primaries above and an ocellus or spot on inner margin of secondaries below ..... 1.
Lacking the above characters ..... 4.
1. With a single ocellus on primaries above ..... 2.
   With two ocelli on primaries above ..... 3.
2. Small species (male expands 43 mm., female expands 53 mm.; ground color light or yellowish-brown ..... **celtis.**
   Larger; ground color orange-ferruginous, or dull fulvous... **alicia.**
3. Color yellowish-brown; three spots in discoidal cell in primaries above ..... **antonia.**
   Color bright castaneous; two spots in discoidal cell of primaries above ..... **leilia.**
4. Both wings of same general color (female); spots of primaries whitish (male); spots in primaries small, outer row 1 mm. in diam.; secondrries 1.5 mm ..... **texana.**
   Color of secondaries darker than primaries (female); spots on primaries yellow, not distinctly lighter (male) ..... 5.
5. Primaries rusty fulvous at base, remainder blackish brown. **clyton.**
   Primaries fulvous at base and remainder of wing orange-ferruginous (tawny) ..... **flora.**

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NEW AND LITTLE KNOWN BEES.

BY T. D. A. COCKERELL.

Sphecodes chionospilus n. sp.—♂. Length about 7½ mm.; head and thorax black; abdomen red, the apical segments dusky, the hind margins of the segments (the second and third very broadly) reddish-golden; legs reddish-black, the knees, hind tibiæ at base and apex, and all the tarsi, ferruginous; spurs pale testaceous; tegulæ creamy-white, testaceous at base; wings hyaline, dilutely infuscated apically, stigma and nervures brown-ferruginous. Head transversely oval; eyes converging below; face and front very densely covered with snow-white pubescence; mandibles dark ferruginous; cheeks and upper part of head with white hair; antennæ dark reddish, long, very strongly moniliform; scape short; second and third joints very short, twice as broad as long; fourth nearly twice as long as second and third together; mesothorax and scutellum shining, with very large scattered punctures; metathorax above rounded, shining, very coarsely cancellate; upper border of prothorax, mesothorax in front, scutello-mesothoracic suture, postscutellum and pleura (the last irregularly) covered with white hair; abdomen shining, with strong widely separated punctures, base of second segment depressed; last ventral segment with a shallow median longitudinal depression.

Variety **sanguinatus** n. var.—♂. Legs entirely bright ferruginous red, with white hair on tibiæ and tarsi; metathorax above not clearly cancellate, but irregularly roughened, the rugæ more or less evidently longitudinal. This looks at first like a distinct species, but every essential detail is as in *chionospilus*, and it can hardly be more than a variety.

♀. Length about 9 to 10 mm., differing from the male in the usual sexual characters, but otherwise similar; mandibles with an inner tooth, far from the apex; flagellum thick, suffused with dark reddish; legs dark with the tibiæ and tarsi more or less reddish, or (var. *sanguinatus*) entirely red; mesothorax and scutellum black, or (var. *sanguinatus*) dark reddish; hind tibiæ densely covered with white hair on outer side; hind spur microscopically serrulate; tongue sharply pointed, about 400 microns long; last five joints of maxillary palpi in microns (2.) 128, (3.) 128, (4.) 96, (5.) 112 (6.) 64.

Habitat.—Karachi, N. W. India, May and June, 1909, (*E. Comber*). British Museum. In a number of characters this resembles *S. indicus* Bingham, but that has the male entirely black, and the hair on the tarsi ferruginous-brown instead of

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white, From *S. rubripes* Spin. it is easily known by the pallid tegulæ, wherein it resembles *S. ruficornis* Sich. and *S. rufithorax* Mor. There is much resemblance to *S. desertus* Nurse, but that has the abdomen very finely and closely punctured.

Sphecodes lautipennis Ckll.

This species was described from Boulder County, Colo. Its range is greatly extended by a couple of males taken by Mr. W. M. Mann at Pullman, Washington State, Sept. 13, 1908.

Sphecodes hesperellus Ckll.

Two males from Pullman, Wash., Aug. 2, 1908 (*W. M. Mann*).

Sphecodes arroyanus Ckll.

This species has been known from New Mexico and Colorado; its range is greatly extended by a female taken by Mr. J. B. Wallis at Lethbridge, Alberta, July 4, 1909. It differs from southern examples in having the mandibles dark red in the middle. It might be confused with *S. clematidis* Rob., but is easily separated by the large broad head.

Nomia exagens (Walker) Meade-Waldo.

At my request Mr. G. Meade-Waldo has kindly examined the type of *Andrena exagens* Walker, 1860, from Ceylon, and as was expected, finds it to be a *Nomia*. It is about 5½ to 6 mm. long. It appears to be related to *N. basipicta* Wickwar, also found in Ceylon.

Nomia muscatensis Ckll.

This species, described from Muscat, Arabia, must be added to the fauna of India, having been taken by Mr. E. Comber at Karachi. Mr. Meade-Waldo informs me that it was known to F. Smith, who gave it a manuscript name. One female is labelled "Hab R., Karachi, Sept. 1909." The male, hitherto undescribed, has also been taken at Karachi by Mr. Comber: one has the date October, 1909. It has the following distinctive characters:

♂. Tegument of thorax black, with the tubercles, the lateral scutellar lobes and the greater part of the postscutellar process ferruginous; antennæ entirely ferruginous, of a darker shade above; hair of face

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dense and very white; hair of thorax and legs white; legs bright ferruginous; hind femora greatly incrassated, triangular; hind tibiæ with a very large broadly rounded lamina, flat above; abdominal bands on segments 1 to 5, white or creamy white, flushed with green.

In the Karachi females the tegument of thorax varies to practically all black except the upper border of prothorax, the hind margin and lobes of scutellum, and the postscutellar process, which are red; the abdominal bands also show a little green. The abdomen is rather rougher and more densely punctured in the male, but the difference is not very conspicuous. The hind tibial lamella of the male is not so long as in *N. lamellata* Smith, and there is no tooth or prominent angle near the middle of the hind margin. *N. bahadur* Nurse, from Deesa, is also a *Crocisaspidia*, but has interrupted bands.

Nomia callichlora n. sp.—♀. Length about 9½ mm.; black, the abdomen with broad bright green bands (the first three flushed with vermillion) on the first four segments; postscutellum with two strong black teeth, close together; middle of face and clypeus with a delicate keel; mandibles dark red in middle; flagellum ferruginous beneath. Very close to *N. elliotii* Smith, which it resembles in most respects, it is however readily separated as follows (the *elliotii* used for comparison is from F. Smith's collection): rather smaller; face narrower, covered wirh white hair; mesothorax smaller, more shining, with smaller punctures, a band of grayish-white hair running along lateral and hind margins, and the disc with much pale hair (dark fuscous hair in *elliotii*); hair of outer side of middle tibiæ entirely white (with a subapical fuscous patch in *elliotii*); green abdominal bands about twice as broad.

Habitat.—Karachi, N. W. India (*E. Comber*). British Museum. A male from Karachi appears to belong here, having just the same pubescence and general structure, but it has the scutellum more or less bituberculate, and the abdominal bands are narrow as in *elliotii*, and very pale. There are bands only on the first four segments, the fourth band being white, while the others are white at the sides and flushed with pale green and red in the middle. The hind legs are formed as in *N. elliotii*. I should have referred this male to *N. elliotii* in the absence of the female, but I have no authentic male *elliotii* to compare.

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Nomia curvipes (Fabr.).

Nasik, Western India, ♀ (*E. Comber*). A male from F. Smith's collection is labelled "India, Nudda."

Nomia eburnigera n. sp.—♂. Length 10½–11 mm.; black, the head and thorax with short sordid-white pubescence, more evidently ocherous on scutellum, dense around borders of mesothorax and scutellum, but sparse on disc, the black surface, shining and very densely punctured, clearly visible; face narrow, eyes converging below; tongue narrow and sharp, but not much over 1 mm. long; basal part of mandibles broadly yellow; scape slender, yellow, suffused with red above; flagellum entirely clear ferruginous; tegulæ moderate, light rufotestaceous; wings hyaline, more or less yellowish, dusky apically; nervures and stigma light ferruginous; second s. m. broader than usual, receiving first r. n. near its end; scutellum and postscutellum unarmed; metathorax hairy; legs (except coxæ and trochanters) pale red broadly marked with canary yellow; middle femora broadened; hind femora very greatly swollen, with about the basal two-fifths red, the apical part yellow, the lower side near apex with a strong sharp tooth; hind tibiæ with a long pointed apical process, which has three sharp edges; the hind tibiæ are yellow, but on the outer side toward the base, where the femoral tooth overlaps when the leg is flexed, is a large dark brown spot; hind basitarsus yellow, reddish at end; abdomen black with a sericeous lustre, shallowly punctured, the hind margins of the first five segments with broad ivory-colored tegumentary bands; sixth segment broadly red at apex, with subbasal dark fuscous hairs; fifth ventral segment with a pair of median hairy projections; sixth emarginate.

♀. Similar, except for the usual sexual differences, and the abdominal bands, which are four in number, and a sort of pale orange; the hair of the thorax above is strongly reddened in three specimens, but in a fourth pallid as in the males. Antennæ red; mandibles broad; clypeus very densely punctured, not at all keeled; legs red without yellow; hind basitarsus broad, angular at apex; wings more strongly colored; apex of abdomen with dark rufofuscous hair; apical plate with appressed ferruginous hair, but the margins and a fine central line bare.

Habitat.—Karachi, N. W. India, type (♂), two other males and three females, one of each sex dated "September, 1909 (*E. Comber*)"; Malir, N. W. India, one of each sex (*E. Comber*). British Museum.

Resembles *N. curvipes*, but that species is larger, with denser red hair on thorax above, abdominal bands in male highly colored, with some green, and fourth ventral segment

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deeply emarginate. The structure of the hind legs is similar in both, though the tibial process is smaller and shorter in *curvipes*. *N. unidentata* Olivier, from the Arabian desert, seems to be allied, but judging from the description is smaller, and the legs of the male are without yellow.

Nomia sykesiana Westwood.

A male from Nasik, Western India (*E. Comber*) appears to me to be Westwood's species, which is separable from *N. antennata* Smith by the smaller size, and broad white (slightly creamy) hair-bands on abdomen. The face is densely covered with brownish-white hair, which is not quite as Westwood describes, but his specimens was probably not in the best condition. The broad and flat last antennal joint is black. The large apical process of the hind tibia is broadly truncate, with two salient points. Tongue linear but short.

Nomia nasicana n. sp.—♀. Length about 9½ mm.; black, including the legs, but the first two abdominal segments clear bright ferruginous, and segments 1 to 4 each with a narrow apical white tegumentary band, that on the first very narrow; face broad, densely covered with glistening white hair; mandibles black with a small and very obscure reddish spot; front dullish; flagellum ferruginous beneath, and the last joint above; mesothorax shining, rather closely punctured, with thin short pale hair, denser along the margins, and scattered dark hairs on the disc; scutellum very shiny, the middle almost without punctures, with long black hair; postscutellum covered with white tomentum, unarmed; area of metathorax rather large, very black, minutely rugose, becoming obliquely striate at sides; tegulæ translucent testaceous, not enlarged; wings hyaline, faintly dusky, stigma piceous, nervures dark brown; second s. m. small, receiving first r. n. just beyond middle; b. n. strongly arched; legs with glittering white hair, pale golden on inner side of tarsi; some dark fuscous hair on outer side of hind tibia at base; abdomen with little hair, but third and fourth segments with a very narrow even basal band of white hair: hair at apex dark fuscous; first four ventral segments red.

Habitat.—Nasik, Western India (*E. Comber*). British Museum. Very close to *N. maculitarsis* Cam., from Poona, of which only the male is known. I do not think *nasicana* is the female of *maculitarsis*, as the latter has the face covered with fulvous hair. Cameron's figure of *maculitarsis* appears to have been drawn from the female of something else.

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Nomia karachiensis n. sp.—♂. Length about 7½ mm.; rather slender, black, with the first abdominal segment and the second at base and apex (the infuscation variable) red; anterior and middle tibiæ, and apices of their femora above broadly, red; hind knees red, and hind tibiæ broadly reddish at base and narrowly at apex; tarsi clear red, basal two-thirds of hind basitarsi pellucid whitish; face densely covered with pale ochreous hair; tongue very sharply pointed, but short; maxillary palpi long; mandibles obscure reddish in middle; antennæ ferruginous, scape infuscated except at ends, flagellum dusky above; thorax above densely clothed with short ochreous hair, but on discs of mesothorax and scutellum it is thin enough to make visible the very fine dense punctures; metathorax densely hairy, basal area small; tegulæ moderate, light ferruginous; wings hyaline, with a dark fuscous apical patch as in *N. terminata* Sm. and *N. kurandina* Ckll.; nervures and the large stigma pale yellowish testaceous; hind femora not modified; hind tibiæ with a prominent subapical tubercle on inner side; abdomen rather shining, very feebly punctured, hind margins of segments with dense dull creamy-white or pale ochreous-tinted hair-bands; first two ventral segments red; fourth nearly covered with a patch of pale ochreous tomentum.

Habitat.—Karachi, N. W. India (*E. Comber*). British Museum. Very near to *N. floralis* Smith, but hardly its male, owing to the quite different character of the scutellum. Vachal has described the supposed male of *N. floralis* from Canton, and while his description indicates a species close to *N. karachiensis*, there are various differences. The type locality of *floralis* is Hong Kong.

Nomia aureohirta Cameron.

Nasik, Western India, both sexes (*E. Comber*). British Museum. This record extends the known range more than 500 miles N. W. The female, before known, has the following distinctive characters: face with a large subtriangular patch of brilliantly shining yellowish hair on each side; clypeus and supraclypeal area strongly, very densely punctured, not at all keeled; mandibles black, faintly reddish in middle; scape long, black, flagellum obscure reddish beneath; hair of thorax above fulvous, but not hiding surface of mesothorax and scutellum, which are densely, minutely, granular-punctate; pleura hairy in front and bare behind: tibiæ and tarsi entirely, and anterior and middle femora broadly at apex, ferruginous; first two abdominal segments with the

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hair-bands confined to the sides, but the apical tegument reddish; the anterior femora are red beneath except at base.

Nomia comberi n. sp.—♀. Length 8 mm. or rather more; head, thorax and legs black; abdomen black and ferruginous; hair of head and thorax pale ochreous-tinted, not abundant; mandibles black; face broad; face, front and vertex very densely punctured; clypeus not keeled; antennæ entirely black; mesothorax and scutellum shining, with small but strong rather dense punctures; postscutellum unarmed, covered with pale ochreous tomentum; area of metathorax with widely spaced delicate ridges, and toward its apex with some transverse ridges; tegulæ shining black; wings long, dark fuscous, stigma and nervures brown; b. n. meeting t. m.; legs with pale hair; hind basitarsus flattened, with a slight screw-like twist, and with a broad brush of orange hair at apex; second joint of hind tarsus very broad though short; abdomen shining, very delicately punctured, first two segments wholly without hair-bands, third and fourth with pale grayish bands, end of fifth with dark fuscous hair; first segment broadly red at sides, except along hind margin, the red nearly continuous in the middle line subbasally; second and third segments red with the apical margin black; fourth with a suffused red basal patch.

Habitat.—Kalutara, Ceylon, 2 ♀, March, 1910 (*E. Comber*). British Museum. Differs from *N. exagens* (Walker) by the larger size, black tarsi, dark wings, etc. Compared with *N. basipicta* Wickwar it is smaller, with differently colored legs and more red on the abdomen.

Nomia phenacura n. sp.—♀. Length about 11½ mm.; appearance of an *Andrena*, with structure of *Nomia* (no facial foveæ, etc.); head and thorax black; legs black except hind tibiæ and tarsi, which are clear red, but the basitarsus with a large black patch on outer side; the middle tarsi may also be clear red, and their tibiæ reddish apically; abdomen with the first three segments clear ferruginous red, the others black, the hind margin of the fourth broadly testaceous-hyaline; head very broad; clypeus flat, a little depressed in middle, shining, with very large irregularly placed punctures; face and front finely rugoso-punctate, sides of front more or less ridged or striate; vertex strongly and densely punctured; hair of head and thorax pale ochreous tinted, not abundant; lower margin of clypeus with long golden hairs; mandibles dark, deeply grooved on outer side; antennæ black, flagellum reddish at apex; mesothorax and scutellum densely and minutely punctured, in entire contrast with the large coarse punctures of the vertex; postscutellum unarmed, densely covered with tomentum; area of metathorax a transverse shining band, with cross-ridges; tegulæ dark with the margin broadly rufotestaceous, not enlarged; wings

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ample, yellowish hyaline, the apical field somewhat dusky; stigma and nervures orange-ferruginous; b. n. strongly covered at lower end; second s. m. a little broader than long, receiving r. n. in middle; legs with pale yellowish hair, scopa of hind legs long and loose; abdomen dullish, without any evident punctures; bands of extremely short hair at sides of second and third segments, and a continuous one on fourth; fifth and apex with pale orange-ferruginous hair; apical plate broad.

Habitat.—Nasik, Western India, 2 ♀ (*E. Comber*). British Museum. A very distinct species, unlike any *Nomia* known to me, but extremely like some *Andrena*, such as *A. erythrogastra* (Ashmead). In Bingham's table it runs nearest to *N. floralis*, to which it has little resemblance.

Nomia phenacopsis n. sp.—♀. Length fully 12 mm.; black, the hind margins of the abdominal segments testaceous-hyaline, and the parts over which they slide reddish-brown; apical part of middle tibiæ, hind tibiæ entirely, and all the tarsi, ferruginous; wings shorter than abdomen, the latter being long and rather narrow, but extended more than usual in the type; face very broad, finely and densely granular-punctate; mandibles black, apical part faintly reddish; flagellum red at apex, and slightly so beneath toward base; vertex with large punctures on a shining ground; hair of head and thorax long and loose, except the usual tomentum on postscutellum, tubercles, etc., and pale ochreous-tinted; mesothorax with strong punctures on a shining ground, smaller than those of vertex, but not conspicuously different; scutellum more densely punctured; postscutellum unarmed; basal area of metathorax irregularly subcancellate; tegulæ dark brown with a pale margin, not enlarged; anterior wings about or nearly 9 mm. long, yellowish-hyaline, a little dusky apically; stigma and nervures light ferruginous; b. n. meeting t. m.; second s. m. broader than long, receiving first r. n. near the beginning of its last third; legs with abundant pale orange hair; apical part of hind basitarsus darkened; second joint of hind tarsus triangular; abdomen with the discs of the segments dullish, with only scattered piliferous punctures; hair-bands white, poorly developed, overlapped by long slightly yellowish hairs, band on second segment confined to sides; hair of apex fulvous; ventral segments with fringes of long yellowish hair, which collect pollen.

Habitat.—Nasik, Western India (*E. Comber*). British Museum. An *Andrena*-like species, structurally very close to *N. phenacura*, but separated by the black abdomen, the much more coarsely punctured mesothorax, etc.

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Nomia oxybeloides Smith.

Mr. Comber took this at Sigiri (March, 1910), Salsette and Karachi. In the females the first r. n. meets the second t. c., the enlarged tegulæ are orange-fulvous, and the mesothorax has scattered very strong punctures on a shining ground. In the male the first r. n. joins the second s. m. near its end, the tegulæ vary to pale ochreous, and the mesothorax is finely, quite closely punctured. Nevertheless, they appear certainly to belong together, and Smith also had them associated; I have a male from F. Smith's collection, while the female has been compared with Smith's type by Mr. Meade-Waldo. *N. aliena* Cameron is evidently closely allied.

Nomia magrettii enecta n. subsp.—Smaller, length 6 mm. or a little over. The female agrees with Gribodo's description of *magrettii* except as follows; tegument of legs entirely dark, with at most faint brownish tints; the shining very sparsely punctured mesothorax practically nude, except for a narrow band of pale ochreous tomentum along anterior margin; vertical part of first abdominal segment scarcely hairy; hair on inner side of tarsi yellowish, but very pale. The male has the mesothorax much more closely punctured than the female; face covered with pure white hair; flagellum bright fulvo-ferruginous beneath; scutellum with a short spine at each posterior corner; hind femora only moderately thickened, but with a subapical hump above; underside of hind femora with long white hairs, spatulate at end; hind tibia pale yellow with a large black median patch, the flattened broadly rounded pale yellow apical lamella not very long, not nearly reaching middle of basitarsus; tarsi pale yellow, with the apical joint of anterior and middle pair, and all the small joints of hind pair, black; middle tarsi long, the last joint long-oval; hind margins of abdominal segments testaceous.

Habitat.—Karachi, N. W. India (*E. Comber*). One of each sex. British Museum. This is perhaps a distinct species, but it is so near to *N. magrettii* that I describe it as a subspecies. *N. savignyi* Kohl is also allied, but considerably larger. Among the Indian species this is near to *N. oxybeloides*, differing in the smaller size, much smaller hind tibial lamella of male, cream-colored tegulæ of female, etc. The first r. n. meets the second t. c., or even enters the corner of the third s. m. The female is without the scutellar spines.

Nomia albolobata n. sp.—Length about or nearly 6½ mm.; black, with rather abundant pale ochreous and white tomentum; head

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broad, eyes strongly converging below; face densely covered with white hair, a little ochreous between antennæ; tongue very sharp but not long; vertex with pale ochreous hair; flagellum dull ferruginous beneath; thorax with hair pale ochreous above, white at sides and beneath; disc of mesothorax with the surface showing, closely punctured but shining; scutellum slightly bigibbous, shining, with irregular punctures; postscutellum densely tomentose, unarmed; area of metathorax reduced to a narrow channel crossed by little ridges; posterior face bare, shining, coarsely punctured, but there is a smooth triangle above, corresponding to the apical part of the basal area; tegulæ very large, closely punctured, creamy white with a dark brown basal patch; wings hyaline, stigma light ochreous, nervures darker; first r. n. meeting second t. c., or entering extreme basal corner of third s. m.; legs very dark brown, with white hair; anterior tibiæ ferruginous in front; anterior and middle tarsi pale yellowish, with the last joint black, the middle tarsi long and slender, with the black joint pear-shaped; hind femora moderately thickened, with a subapical hump or angle; hind tibiæ with a very large creamy-white lobe; hind basitarsus creamy-white, the other joints dark brown; abdominal segments coarsely punctured across the disc, the hind margins broadly smooth; the segments with much dense tomentum of a pale ochreous color, but the apical half of first segment bare except at sides, and the second to fourth segments with bare bands; fourth ventral bidentate in middle.

Habitat.—Hyderabad, N. W. India (*E. Comber*). There is some resemblance to *N. latispina* Cam. from Allahabad, but the hind femora are differently shaped, and there are various other differences. The difference in the shape of the hind femora also at once separates *N. albolobata* from *N. oxybeloides;* in the latter the femora are very thick, with the hump or angle near the middle.

Nomia flavolobata n. sp.—♂. Length about 10 mm.; similar to *N. albolobata*, but much larger, and differing also as follows: hair of face pure white throughout; antennæ entirely ferruginous, scutellum dullish, very densely punctured, with erect light brown hairs; sides of upper part of truncation of metathorax hairy; apical margin of first abdominal segment hairy right across; hind femora enormously swollen, triangular in lateral view, with the highest point a little beyond the middle; expanded lobe of hind tibiæ clear primose yellow. In one specimen the metathorax and anterior and middle legs show much ferruginous. Compared with *N. savignyi* Kohl this species is so similar that on superficial examination they appear exactly the same. *N. savignyi* is readily separated, however, by the flattened shining (though

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very coarsely punctured) scutellum, with a long sharp yellowish tooth or spine on each side; it also has the scape, and flagellum above more or less, infuscated; the tegulæ somewhat larger; the apical band on first abdominal segment confined to the sides (as in *N. albolobata*, but differently from *albolobata*, the depressed apical part is conspicuously finely punctured); and the genitalia are different. In *N. flavolobata* the lateral pieces, at the sides of apical ventral region of the abdomen, appear as large elongate ferruginous elevations; in *N. savignyi* the same place is occupied by small shining piceous tubercles.

Habitat.—Karachi, N. W. India (*E. Comber*). British Museum.

Nomia savignyi Kohl.

This species, described from Aden, is to be added to the fauna of India, both sexes having been taken by Mr. Comber at Karachi, May and June, 1909. The female differs from the male in the usual manner; the scutellum is without the teeth; the femora are variably ferruginous.

I give a key for the separation of the Indian species with large tegulæ discussed above.

Males ..... 1.
Females ..... 5.
1. Process of hind tibiæ small, not reaching middle of basitarsus; small species ..... **enecta** Ckll.
   Process of hind tibia large ..... 2.
2. Larger species (about 10 mm.); process of hind tibiæ primrose yellow ..... 3.
   Smaller species; process of hind tibiæ white ..... 4.
3. Scutellum with long spines ..... **savignyi** Kohl.
   Scutellum unarmed ..... **flavolobata** Ckll.
4. Hind femora much swollen ..... **oxybeloides** Smith.
   Hind femora not greatly swollen ..... **albolobata** Ckll.
5. Larger; mesothorax closely punctured ..... **savignyi** Kohl.
   Smaller; mesothorax sparsely punctured ..... 6.
6. Smaller; tegulæ cream-color with a dark basal spot... **enecta** Ckll.
   Larger; tegulæ orange-fulvous ..... **oxybeloides** Smith.

None of these have tegumentary abdominal bands.

Nomia parcella n. sp.—♂. Length about 6½ mm.; rather slender, with the appearance of male *Halictus subhirtus* Lep.; black, the hind margins of the abdominal segments suffusedly rufous; head broad; face densely covered with shining pale ocherous hair; vertex dull, closely and finely punctured, but area around middle ocellus shining; scape very dark brown; flagellum long and thick, pale dull ferrugin-

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ous beneath, dusky above; mesothorax and scutellum shining, with fine punctures; hair of thorax dull, grayish or ochreous tinted, mostly thin and loose, but dense on tubercles and postscutellum; basal area of metathorax poorly defined, irregularly strigose; posterior face of metathorax shining, rounded at sides except below, where there are sharp edges; tegulæ pale reddish-testaceous, not enlarged; wings hyaline, faintly dusky, the large stigma and the nervures light rufo-testaceous; b. n. falling a little short of t. m.; second s. m. very narrow; receiving first r. n. before the middle; legs light rufo-testaceous, with long pale hair; anterior femora behind, and middle and hind femora except apically, as well as their coxæ, dark brown, but hind trochanters beneath conspicuously pallid rufous; abdomen shining, with exceedingly feeble and minute punctures; first segment seen from above a nearly equilateral triangle; dull white hair-bands at sides of first three segments, and entire on fourth and fifth, and on the apical half scattered pale hair; venter shining, but a large patch occupying the greater part of disc of fourth segment depressed and dull; fifth ventral with a shallow median pit. Legs not modified.

Habitat.—Karachi, N. W. India (*E. Comber*). British Museum. This has some resemblance to *N. parca* Kohl, but differs in the color of the legs. The hind tibiæ of *parcella* are very slender basally, gradually narrowing to a broad apex, without the subapical inner projection seen in *parca*.

Nomia halictura n. sp.—♀. Length about 9 mm. or a little over, anterior wing 7, black, the abdomen with a brownish tint; head broad, eyes converging below; face and cheeks with rather thin grayish pubescence; tongue slender but not long; front striate in middle, smoother and shining at sides; antennæ dark, the flagellum ferruginous apically; thorax with grayish pubescence, a little ochreous above dense on tubercles, upper border of prothorax and postscutellum; mesothorax very closely punctured; scutellum more shining, the discal punctures more separated; area of metathorax triangular, poorly defined apically, the basal part strongly and closely striate; posterior truncation with a sharp lateral edge only below; tegulæ not enlarged, reddish clouded with fuscous; wings strongly infuscated; stigma rather dark reddish, nervures yellowish; second s. m. about as broad as long, receiving first r. n. in middle; legs black with coarse pale hair, light yellowish on inner side of tarsi; outer side of hind tibiæ with fuscous hair intermixed; abdomen broad in middle narrowed basally, the first segment forming a nearly equilateral triangle; segments without punctures, their hind margins rufo-testaceous; first two segments with pale ochreous hair-bands at sides only, but on the third and fourth they are entire; there is also much long loose hair. Marginal cell obtuse at apex, as usual in *Nomia*.

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Habitat.—Nasik, Western India (*E. Comber*, 23). British Museum. Very near to *N. parcella*, but evidently not its female, from the much larger size, darker wings, and much broader second s. m., as well as the darker tegulæ, and dull, more coarsely punctured mesothorax. It looks exactly like an *Halictus*. The Australian *N. halictella* Ckll. is very similar, but has the base of the abdomen much broader.

Nomia nursei semifortis n. subsp.—♂. Agrees with Cameron's description of *N. nursei* except as follows: flagellum broadly light yellowish beneath, above broadly black; cross-ridges of metathoracic enclosure practically uniform; posterior face of metathorax shining, rugose with a linear median sulcus; abdominal hair-bands light ochreous (not gray); hind tibiæ with a large rufous patch on outer side. Also very near to *N. fervida* Smith, but distinguished by the leg-characters mentioned by Cameron for *nursei*, and also by the shining vertex, with large punctures.

Habitat.—Karachi, N. W. India (*E. Comber*). British Museum. This may be no more than an individual variation of *N. nursei*, but it probably represents a distinct race. From *N. aureohirta* Cam. it is easily known by its smaller size, the densely punctured surface of mesothorax and scutellum not hidden by tomentum, and the coarsely punctured apical half of the first three abdominal segments.

Nomia virgata n. sp.—♀. Length about 9 mm.; black, with grayish-white pubescence, which forms broad dense bands on the hind margins of the abdominal segments, interrupted in the middle on the second, and confined to the sides on the first; the hind margins of the segments also have the tegument pale testaceous; head broad; face with grayish-white hair, denser at sides; lower edge of clypeus with pale golden hairs; clypeus closely punctured, the punctures larger on lower part; front closely and coarsely punctured; vertex narrow, well punctured; scape long; flagellum short, ferruginous beneath; mesothorax and scutellum very closely punctured, the punctures much smaller than those on front; broad upper surface of prothorax, tubercles, postscutellum, posterior margin of mesothorax broadly, and a line along anterior border of scutellum, covered with felt-like tomentum; area of metathorax with feeble ridges, the apical triangle cut off by a sharp transverse ridge; tegulæ pale testaceous in front, dark rufous behind; wings dusky, the comparatively small stigma and the nervures dull testaceous; marginal cell very obtuse at end; second s. m. broader than long, receiving first r. n. near its end; b. n. arched only

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at lower end; legs black with light hair, anterior and middle knees red; hair on outer side of hind legs glittering silvery; hind basitarsus broad; abdomen very broad at base; first segment evidently punctured, second more feebly so, the others hardly at all; apical plate broadly rounded at end; venter with silvery hair. Clypeus not keeled.

Habitat.—Karachi, N. W. India (*E. Comber*). British Museum. In Bingham's table of Indian *Nomia* this could run near *N. rustica* or *N. aurata*. *Nomia rustica* Westwood, described from the male, is perhaps allied, but has dark brown nervures and some other differences probably not due to sex. *N. aurata* Bingh. has rufo-testaceous legs and many other distinctive characters. Superficially *N. virgata* resembles some species of *Andrena*, as *A. simulata* Prov. = *canadensis* D. T.

Nomia andrenina n. sp.—♀. Length about 10 mm., rather robust, resembling an *Andrena*; black, with very pale ochreous pubescence, that on face grayish, rather dense, the same from side to side; mandibles black; clypeus and face minutely granular, the clypeus not keeled; flagellum short, obscure reddish beneath; distinctly red at apex; front dull and granular, but vertex shining, with large separate punctures; mesothorax and scutellum densely and very finely punctured; upper border of prothorax, tubercles, postscutellum and posterior margin of mesothorax densely tomentose; metathorax hairy, except the narrow basal area, which is finely cross-striate; tegulæ pale testaceous, dark basally; wings dusky, nervures and stigma yellowish-testaceous; marginal cell very obtuse at end; second s. m. broader than long, the first r. n. joining it about the beginning of its last third; b. n. strongly arched at lower end, meeting t. m.; coxæ, trochanters and femora very dark brown, the knees a little reddish; anterior tibiæ dark, reddish at apex; middle tibia red at base and broadly so at apex; hind tibiæ entirely red; tarsi ferruginous, hind basitarsus with a large dark patch on apical half; hair of legs pale golden; abdomen broad, dullish, not punctured, hind margins of segments broadly rufo-testaceous; base broad; apices of segments with very broad bands of pale ochreous tomentum, reduced to lateral patches on segments 1 and 2, entire on 3 and 4; apex with bright rufofulvous hair.

Habitat.—Type from Karachi, N. W. India (*E. Comber*). British Museum. Another one was taken by Mr. Comber at "Shpali," an abbreviation of the name of some place near Karachi. Very close to *N. aureohirta* Cam., but the latter has the clypeus more strongly punctured, the hair of the sides of the face much more dense than on clypeus, the

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stigma smaller, the first r. n. joining second s. m. about the middle, the truncation of metathorax broader, and the legs with more red. There is also some resemblance to *N. phenacopsis* Ckll., but that species is larger, and has large strong punctures on the mesothorax, the surface between the punctures shining.

Nomia ardjuna n. sp.—♀. Length about 9 mm.; black, including legs; head, thorax and legs with dense white hair, but this is absent from posterior face of metathorax, while the mesothorax, scutellum and postscutellum are densely covered with short orange-fulvous pubescence; sculpture of face hidden by pubescence; vertex dull, without distinct punctures, shining between the ocelli; scape long, black; flagellum short but rather slender, ferruginous at base and apex beneath; base of metathorax with a narrow transversely striate groove, the striæ oblique; truncation with a large dagger-shaped median depression; tegulæ pale testaceous, the basal half covered with hair; wings dusky hyaline, the small stigma and the nervures piceous; second s. m. small but not narrow, receiving first r. n. a little beyond middle; tongue very sharp, but short; hair on inner side of hind tarsi reddish-gray; abdomen rather shining, with scattered small punctures; hind margins of the first four segments pale reddish testaceous, covered with very broad bands of dense pale ochreous tomentum, that on first very broadly interrupted, or only nearly so; no bright colored hair at apex.

Habitat.—Type from Karachi, N. W. India (*E. Comber*). British Museum. Also taken by Mr. Comber at "Shpali." Resembles *N. scutellata* Smith, but hair of face entirely white, nervures dark (testaceous in *scutellata*), etc. Also to be compared with *N. albofimbriata* Cam., but that has narrow abdominal hair-bands, testaceous stigma, etc.

Nomia ustula n. sp.—♂. Length about 8½ mm.; black; the mesothorax and scutellum covered with very short fulvous hair; on the mesothorax rather thin, so that the very finely, closely and minutely punctured surface is visible; on the scutellum very dense and very bright colored. Mandibles pale reddish in middle; eyes very strongly converging below; face densely covered with shining very pale yellowish hair; front and vertex finely granular, with thin fulvous hair; scape covered with long fulvous hair; third antennal joint somewhat enlarged, bright orange-fulvous beneath except at base; flagellum broadly black above, ferruginous beneath; pleura, tubercles and upper edge of prothorax with white or almost white hair, postscutellum with light fulvous tomentum; area of metathorax dullish, without evident sculpture,

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the triangular apical part not separated from the base; tegulæ ferruginous, dark at base; wings dusky, the nervures and rather small stigma dull sepia; b. n. arched; second s. m. narrow, receiving first r. n. a little beyond middle; legs black, with grayish-white hair, anterior and middle knees reddish; hind trochanters with a prominent sharp tooth; hind femora only moderately swollen; hind tibiæ broad, with a chestnut-colored apical lobe, only reaching to about the middle of the adjacent spur; hind tarsi long; abdomen shining, evidently punctured, the first segment smoother; first segment with much erect pale ochreous hair; first four segments with rather narrow, not dense, apical hair-bands, ochreous tinted in middle, dull white at sides; fourth ventral segment with a strong median keel.

♀. Similar, except for the usual sexual differences; clypeus granular, not keeled; sides of face with grayish-white hair; front dull, vertex shining; hair on inner side of hind basitarsus pale yellowish; sides of apex of abdomen with some fuscous hair.

Habitat.—Type (male) from Kandy, Ceylon, Feb., 1910 (*E. Comber*). British Museum. Female from Dambulla, Ceylon, March, 1910 (*E. Comber*). Resembles *N. ardjuna*, but rather smaller, with the inner upper orbital margins (female) more concave, the base of metathorax without sculpture, etc.

Nomia perlucida n. sp.—♂. Length about 10 mm., anterior wing 7; shining black, with white hair, grayish on head and thorax above; mandibles black; eyes only moderately converging below; face densely covered with white hair; scape short, black; flagellum long, dull ferruginous, a little dusky above, the last joint dusky, thick, obliquely truncate; vertex shining, with very fine punctures; mesothorax and scutellum shining, with distinctly separated strong punctures; postscutellum densely covered with white tomentum; scutellum slightly bilobed, not toothed; metathorax with a broad basal feebly sculptured channel; apical truncation shining, sparsely punctured, with a median short groove; tegulæ pale testaceous, not enlarged; wings hyaline, with a smoky apical cloud; stigma and nervures sepia; b. n. meeting t. m.; second s. m. broader than long, receiving first r. n. at or just beyond the middle; legs very dark reddish brown, with white hair; hind trochanters with a tubercle beneath; hind femora hairy, moderetately incrassate; hind tibiæ with a dark pointed apical lobe not as long as the spurs; hind basitarsus obtusely angulate posteriorly near the middle; abdomen shining, irregularly punctured, the punctures on first segment large and strong; hind margins of segments with dense, rather broad, bands of white tomentum; fourth ventral segment with a triangular smooth median area; abdomen ending in a broadly rounded ferruginous plate.

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♀. Similar, except for the usual sexual differences; clypeus densely granular punctate, not keeled; flagellum ferruginous beneath; hair on inner side of hind tarsi very pale yellowish.

Habitat.—Type from Karachi, N. W. India (*E. Comber* 83; male, marked by the collector "probably new"). British Museum. Females collected by Mr. Comber at Karachi and Malir. In Bingham's table this runs to *N. rustica*, which differs in the venation, structure of the abdomen, etc. The lower side of the male hind femora is practically flat, not at all concave.

The following key separates the Indian species described above, in which the tegulæ are not enlarged, and the abdomen is not partly red, except sometimes the reddish hind margins of the segments.

Males ..... 1.
Females (none very small) ..... 6.
1. Very small (length about 6½ mm.), hind legs not noticeably modified ..... **parcella** Ckll.
Much larger ..... 2.
2. Hind legs without yellow (a pale tibial lobe in *thoracica*) ..... 3.
Hind legs with much bright yellow ..... 5.
3. No rufous hair on thorax ..... **perlucida** Ckll.
Scutellum covered with rufous tomentum ..... 4.
4. Much larger; wings strongly reddish; postscutellum with white hair, contrasting with that of scutellum.... **thoracica** Smith
Much smaller; wings not reddish; hair of postscutellum ochreous. **ustula** Ckll.
5. Larger; hind femora red and yellow ..... **aureohirta** Cam.
Smaller; hind femora black and yellow. **nursei semifortis** Ckll.
6. At least the hind tibiæ and tarsi clear ferruginous ..... 7.
Hind tibiæ and tarsi not ferruginous ..... 9.
7. Sides of face glittering, more densely pubescent than clypeus. **aureohirta** Cam.
Clypeus and sides of face with pubescence the same ..... 8.
8. Mesothorax with large punctures on a shining ground. **phenacopsis** Ckll.
Mesothorax with very small dense punctures ..... **andrenina** Ckll
9. Sctutellum shining, with irregular punctures, large and small. **perlucida** Ckll.
Scutellum finely punctured, or covered with tomentum ..... 10.
10. Mesothorax and scutellum densely covered with orange-fulvous tomentum ..... **ardjuna** Ckll.

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Scutellum densely covered with ferruginous tomentum, but mesothorax much less densely tomentose, except posteriorly. **ustula** Ckll.

Scutellum not densely covered with tomentum.....11.

11. First abdominal segment, seen from above, a nearly equilateral triangle.....**halictura** Ckll

First abdominal segment very broad, not at all triangular. **virgata** Ckll.

Colletes comberi n. sp.—♀. Length about 8 mm.; anterior wing about 6; black, with white pubescence, neither ochreous nor mixed with dark on thorax above; malar space about a fourth broader than long, striate basally; clypeus prominent, shining, with scattered punctures, middle depressed, lower margin distinctly emarginate; supraclypeal area shining, punctured at sides; sides of face and cheeks densely covered with long pure white hair; vertex with extremely fine punctures; labrum smooth and shining, without a pit in the type specimen, with a central pit in the other; scape and base of flagellum black, rest of flagellum broadly light ferruginous beneath, blackish above; thorax with much white hair; mesothorax and scutellum shining, with sparse small punctures, disc of scutellum impunctate; base of metathorax with quadrangular areas separated by fine ridges; truncation with long hair; tegulæ hyaline, tinged with testaceous; wings clear hyaline, stigma clear ferruginous or amber-color, nervures ferruginous the outer ones rather dusky; second s. m. very large, broader than third, receiving first r. n. a little beyond middle; legs black, with white hair, tarsi red at apex; hair on inner side of hind basitarsus white, yellowish at tip; hind spur apparently simple, the minute denticulations only visible with a high power of the microscope; abdomen with extremely fine punctures; hind margins of segments reddish, but in good specimens covered with short white hair; first two segments with the base broadly covered with white hair, leaving only a narrow discal band showing the surface; on the third and fourth segments the basal white hair is not so prominent, and on the fifth it is absent, though the whole segment is thinly pilose; the apical segment has appressed yellowish-tinted hair; last ventral sparsely punctured. Last joint of maxillary palpi a litte longer than fifth. Measurements of antennal joints in microns: (2.) 160, (3.) 176, (4.) 145, (5.) 160, (6.) 176.

Habitat.—Karachi, N. W. India (*E. Comber*). British Museum. This does not resemble any described Indian species. It may be compared with *C. mixtus* Rads., from which it differs by white abdominal bands, not tinged with yellowish, and the light brightly colored stigma. A very similar (undescribed) species occurs at Alamosa, Colorado.

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Osmia integra Cresson.

♂. Campus of University of New Mexico, Albuquerque, at flowers of *Astragalus*, April 19 and 26 (*J. R. Watson*). New to New Mexico.

Osmia watsoni n. sp.—♂. Length about 10 mm., general aspect of *O. latreillei* Spin., but very distinct by the peculiar antennæ. Head and thorax yellowish-green, but sides of thorax, and sometimes front and vertex bluish or blue-green, scutellum with brassy tints; abdomen yellowish-green, varying to blue-green, hind margins of segments concolorous; legs black, the hind femora in front very faintly metallic; hair of face dense and white, of head and thorax above long and pale ochreous; of abdomen pale ochreous, thin, not forming evident bands; mandibles shining, with a long apical tooth, and a variably crenulate or subdentate inner cutting margin; eyes reddish-brown in the type, in the other specimen green; scape and second antennal joint black; flagellum clear light ferruginous above and below, strongly crenulated behind, but with the last joint flattened, more or less discoid, shining black; tarsi ferruginous apically; middle tarsi normal except that the basitarsus is somewhat thickened; hind basitarsus conspicuously broadened and flattened toward end; nervures and stigma dark, more or less reddish; sixth abdominal segment with a large notch in type, a very small one in the other specimen; seventh segment narrowed apically, with two very strong parallel teeth; venter with no unusual features.

Habitat.—Campus of University of New Mexico, Albuquerque, at flowers of *Astragalus*, April 8 (type) and 18 (*J. R. Watson*). Very easily known by the unique antennæ.

Dioxys phaceliæ n. sp.—♀. Length about 8½ mm.; black, eyes dark plumbeous; tarsi, apices of tibiæ, and hind tibiæ suffusedly behind, dark red; hind spurs red; hair of head and thorax pale ochreous, darker and redder on face; hind margins of abdominal segments with narrow reddish-brown hair-bands; head, thorax and abdomen coarsely and densely punctured; tegulæ piceous; wings dilute fuscous, slightly violaceous; postscutellar spine slender; apical segment of abdomen broad, triangular, with the sides in outline gently convex, and the apex obtuse; venter strongly punctured.

Habitat.—Albuquerque, New Mexico, at flowers of *Phacelia corrugata* A. Nelson, April (*J. R. Watson*). Readily known from other American species by the shape of the last abdominal segment and the reddish abdominal bands.

Andrena comberiana n. sp.—♀. Length 9 mm. or a little less; head, thorax and legs black, the small joints of the tarsi ferruginous;

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first two abdominal segments, apex and base of third, and a small basal mark on each side of fourth, clear orange-ferruginous, but the first segment with a dark mark on each side near the base, and the second with an oval black spot on each side; pubescence white, faintly yellowish on head and thorax above, white with a slight creamy tint at apex of abdomen; facial quadrangle a little broader than long; process of labrum very broad, truncate; malar space linear; clypeus shining, sparsely punctured; front dull; facial foveæ pale, close to eye, not extending below antennæ, their width about half distance between eye and antennæ; antennæ black, the last seven joints broadly bright ferruginous beneath; third joint perhaps a trifle longer than next two combined; mesothorax and scutellum shining, with sparse very small punctures; metathorax dull, the merely granular area scarcely defined; tegulæ pale testaceous; wings hyaline, very faintly brownish, nervures and stigma sepia, the latter pallid centrally; second s. m. broad, receiving first r. n. near its end; abdomen shining, with excessively minute punctures, thin white apical hair bands on segments 2 to 5, very thin on second.

♂. Length about 8 mm., more slender; clypeus white with two black spots; antennæ short for a male, last eight joints broadly light yellowish-ferruginous beneath; base of flagellum beneath very black; face with much white hair; abdomen black; with the apical margins of the first three segments, and the lateral bases of second and third, red.

Habitat.—Karachi, N. W. India (*E. Comber*). British Museum. The type is a male. In Schmiedeknecht's table of European species, this runs in both sexes nearest to *A. ventralis*, but is readily separated by the shorter antennæ of the males and other characters. In the scarcely defined area of metathorax it resembles *A. arima* Cam. from Simla. The general appearance of the female recalls *A. marginata* Fabr., but there is no close affinity.

Xylocopa auripennis Lep.

Island of Hainan, March, 1909 (*H. Schoede*). Berlin Museum.

X. bryorum Fabr.

Cairns, Queensland (*Froggatt*).

X. collaris binghami Ckll.

Island of Hainan, March, 1909 (*H. Schoede*). Berlin Museum.

X. orichalcea Lep.

Formosa (*Sauter*). Berlin Museum. The localities are

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Pilam and Kagi. One in the U. S. National Museum is from Horisha, Formosa (*T. Fukai*).

X. sauteri Friese.

Formosa (*Sauter*). Berlin Museum. The localities are Teraso(April), Chikutoge (May) and Pilam (February).

X. sauteri var. **nigrescens** Friese.

Formosa (*Sauter*). Berlin Museum. The specimens are from Teraso (April), Taihanroku (August), Kaukau (April), and Fuhosho (April). A remarkable scarlet-red beetle, with very large mandibles, was found in the nest of this bee in a tree. I sent a drawing of it to the British Museum, and Mr. Gahan informs me that it is a *Cissites*, probably *C. maxillosa* Fabr.

X. ruficeps Friese.

Formosa (*Sauter*). Berlin Museum. The locality is Taihanroku, August, 1908. The male has the head much smaller than that of the female: it resembles *X. rufescens*, but differs in the head. The female is not at all like *X. rufescens*.

THYGATINA n. g. (*Anthophoridæ*).

Related to the Neotropical genus *Thygater* Holmberg, but with the second submarginal cell receiving the first recurrent nervure at the end of the the third fifth or second third, the lower side obtusely angled at the junction, so that the cell is pentagonal; female with clypeus wholly without a keel, and third antennal joint shorter than in *Thygater*, being about as long as the next two united. Maxillary palpi 3-jointed; first joint stout, brown; the other two slender, pale ferruginous, the third much longer than the second (in type species third joint is about 145 microns long). Labial palpi with first joint about twice as long as second, the two apical joints very minute.

Thygatina fumida n. sp.—♀. Length about 12½ mm., width of abdomen a little over 4½; robust, black, but the labrum slightly reddish, especially at base, the mandibles with a broad orange-fulvous stripe (but no basal spot), and the tegulæ ferruginous with a dark patch anteriorly; head broad, eyes parallel, facial quadrangle a little broader than long; mandibles notched at extreme apex; labrum covered with coarse pale ochreous hair; clypeus dull, with dense elon-

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gate punctures; hair of head dull white, strongly mixed with black in supraclypeal region, and nearly all black on front and vertex, though pale on occiput and cheeks; scape short; antennæ black, the last joint slightly reddish; hair of thorax soot-color, conspicuously plumose; mesothorax strongly punctured, dull, the anterior middle shining; area of metathorax dull, but lower part of truncation shining, with a deep median pit; wings strongly infuscated, nervures piceous; b. n. falling a very little short of t. m.; third s. m. rather short; legs black, the hind femora, hind tibiæ behind, and middle femora more or less ferruginous; spurs light ferruginous; hair of anterior and middle femora and tibiæ mainly grayish, but of hind tibiæ longer and black or blackish, of all the tarsi black on outer side and red on inner; scopa of hind legs long and loose, plumose; abdomen very finely punctured, the hind margins of the first two segments broadly suffused with reddish; abdomen with black hair, very short and thin above, long beneath, and dorsally with much pale hair on basal declivity of first segment, a very inconspicuous narrow band of pale tomentum at base of second, and obscure median narrow bands on third and fourth; apex with fuliginous hair; apical plate transversely striated (as in *Thygater*).

Habitat.—Kandy, Ceylon, February 10, 2 ♀ (*E. Comber*). British Museum. A very surprising discovery.

Anthophora porteræ Ckll.

♀. Campus of University of New Mexico, Albuquerque, at flowers of cherry, April 18 (*J. R. Watson*).

Anthophora porteræ var. **watsoni** n. var.

♂. Hair of thorax above pale, with a yellowish tint, and without any intermixture of black. I had at first taken this for a distinct species, but in size, form of legs, pubescence, face-markings, etc., it agrees exactly with *porteræ*. The last joint of the middle tarsus has long black hair on each side. Albuquerque, New Mexico, at flowers of *Phacelia corrugata* A. Nelson (*J. R. Watson*).

Anthophora lesquerellæ (Ckll.).

♂. Campus of University of New Mexico, Albuquerque, at flowers of *Astragalus* (*J. R. Watson*).

Tetralonia lycii (Ckll.).

♂. Albuquerque, New Mexico, at flowers of *Astragalus*, April 10 (*J. R. Watson*).

Tetralonia phaceliæ n. sp.—♀. Length about 13 mm., general build and appearance of *T. annæ*, hind spur not hooked. Hair of

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head and thorax very pale grayish, delicately ochreous-tinted on thoracic dorsum; facial quadrangle about as broad as long; eyes pale bluish-green; clypeus shining, with very large more or less confluent punctures, and a broad shining median ridge; antennæ black; mesothorax coarsely punctured, but shining between the punctures; tegulæ black in front, ferruginous behind; legs black, with pale grayish hair, ferruginous on inner side of hind basitarsi; wings grayish; abdomen rather narrow for the genus, black, with very broad bands of grayish-white tomentum; the second segment is covered with this tomentum except the bare apical margin, and the extreme base, which has black velvety tomentum, broadening a little at sides; the third and fourth segments have the bands broad and even, with about the basal two-fifths of third and one-half of fourth covered with black velvety tomentum; the fifth segment has the broad fringe white, stained with chocolate in the middle; the apical has the hair strongly stained with chocolate; apical plate rather broad.

Habitat.—Albuquerque, New Mexico, at flowers of *Phacelia corrugata* A. Nelson, April 29 (*J. R. Watson*). Known from *T. annæ* Ckll. by the creamy-white (not ferruginous) hair on outer side of hind tibiæ and tarsi, the strong median ridge on clypeus, and the denser and whiter abdominal bands, those on third and fourth segments without overlapping long black hairs. From *T. belfragei* (Cress.) it is easily known by the very broad bands, especially that on second segment. From *T. douglasiana* Ckll. it is known by the black at extreme base of second abdominal segment and the ridge on the clypeus.

Melissodes atrifera sandiarum Ckll.

A male collected by Professor Watson at flowers of *Croton*, Sandia Mts., New Mexico, July 26, differs from the type in having a light yellow band across the lower part of the clypeut, reminding one of *M. hexacantha* Ckll. (which has much shorter antennæ) and *M. confusiformis* Ckll. (which has much darker antennæ).

Ceratina sexmaculata Smith.

Smith correctly associated the sexes, but Bingham described and figured the male of *sexmaculata* as a female, and probably confused the true females with *C. binghami*. *C. binghami* is a distinct species, the male having no black patches on the abdomen. From the British Museum I have

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the following *sexmaculata* out of the Comber collection: male, Karachi, N. W. India, Sept. 1909; females, Karachi, Nasik and Sigiri. In the Sauter collection from Formosa, received from the Berlin Museum, *C. sexmaculata* is represented from Takao (June, July, September, October, November, December), Kagi (August) and Koroton (September).

CERATINA subg. CERATINIDIA.

There are two very closely allied species of *Ceratinidia* in Formosa, separable as follows in the female:

Rather larger (sometimes over 10 mm.); verttcal yellow bar on clypeus very broad; sides of mesothorax in front shining, with well separated punctures.....**hieroglyphica** Smith.

Rather smaller; vertical bar of clypeus rather narrow; sides of mesothorax in front (in both sexes) dullish, minutely rugosopunctate.....**morawitzii** Sickmann.

C. hieroglyphica Sm.

All the Formosan specimens (Sauter collection, Berlin Museum) are females. They are from Kagi (August 26), Koroton (September 8), Kanshirei (June 8), and Taihanroku (June 11).

C. morawitzii Sickm.

The Sauter collection contains 16 ♀, 9 ♂ from Takao (June, July, August, September, October, December) and a male from Gyamma (June 4). From Taihanroku, June 11, is a single specimen of a variety of the female, having the upright band on the clypeus reduced to a small projection, broader than long.

Apis dorsata Fabr.

Island of Hainan, March, 1909 (*H. Schoede*). Berlin Museum. This is the same as the Ceylon form.

Apis indica peroni (Latr.).

Twenty workers from Formosa (*Sauter*), the localities being Takao, Taihanroku, Pilan, and Lake Candidius. The series is very variable. One comes from the Island of Hainan, March, 1909 (*H. Schoede*).

Apis florea sumatrana Enderlein.

Dambulla, Ceylon, March, 1910, one worker (*E. Comber*). British Museum. This form was described from Sumatra;

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it lacks all red color on the abdomen, except that, at least in the Ceylon specimen, the hind margins of the segments are very narrowly reddish. The form *andreniformis* Smith is almost the same, but has the base of the second abdominal segment slightly rufopiceous. A specimen of *andreniformis* from the Khasia Hills (*Sladen*) has the hair on the metathorax very light yellowish, whereas in the Ceylon *sumatrana* it is white. In the Ceylon specimen the hair fringing the hind margins of the hind tibia and basitarsus is white, whereas in the Khasia Hills *andreniformis* and a *florea* from Calcutta (*Sladen*) it is black.

Apis florea nasicana subsp. nov.

Worker. First two abdominal segments and base of third bright ferruginous, rest of abdomen black, without evident basal hair-bands; hair fringing hind tibia and basitarsus behind, and the tibia in front, pure white; scutellum entirely black; hair of metathorax white; marginal cell with no appendicular nervure; stigma ferruginous.

Habitat.—Nasik, Western India (*E. Comber*). British Museum. This is evidently different from the form found at Calcutta, which I take to be genuine *A. florea*.

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The GERRIDS of the Atlantic States (Subfamily Gerrinæ).

BY J. R. DE LA TORRE BUENO.

No entomologist, I suppose, who has collected in the free open spaces and wandered afield in quest of his trophies, has failed to see and notice, at one time or another, those strange long-legged insects that walk the waters as though they offered a solid surface to support them, and which we in this country call, "Water-striders." These insects, together with other and smaller forms make up the family *Gerridæ* in the great Heteropterous series, possibly one of the most remarkable aggregations of species known to the entomologist. Their haunts range from living springs, clear, secluded, shady and cool, to the vast expanses of the tropic ocean steaming under a torrid sun or lashed by wild storms into mighty waves. These last Gerrids are members of a most interesting tribe, the Halobatini, which occurs in all more or less extensive bodies of water, but never, to my knowledge, in currents of any kind. One of the oceanic forms visits our own Southern coasts and certain lacustrine species are common inhabitants of our ponds and lakes.

The family Gerridæ differs from all the other Heteroptera so far known from America, in having the claws sub-apical, that is, inserted in more or less of a cleft at some distance from the apex of the last tarsal segment. The heterogeneous assemblage of forms which ordinarily go under the name of "water-striders," may be differentiated by the following key, which presupposes some acquaintance in the field with the various species and genera.

KEY

to the families of the aquatic and semi-aquatic *Trochalopoda* (Gymnocerata), or Littoralia of the old authors.

1. (6.) Claws apical.
2. (3.) Head much produced in front of eyes, slender delicate insects, winged or wingless.....Family HYDROMETRIDÆ.

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3. (2.) Head normal, not greatly produced beyond eyes.
4. (5.) Antennæ moderately long and slender, four-jointed, bugs of moderate size (about 5 mm.), winged or wingless, body generally green in color .....Family MESOVELIIDÆ.
5. (4.) Antennæ short and comparatively stout, 5-jointed, last joint fusiform, minute species (less than 3 mm.), winged or (rarely) wingless.....Family NÆOGEIDÆ.
6. (1.) Claws subapical at least in one pair of feet.
Family GERRIDÆ.
7. (10.) Posterior femora extending beyond the abdominal apex.
Subfamily GERRINÆ.
8. (9.) Inner margin of the eyes convexly rounded; body comparatively short and broad, abdomen so short as to appear almost nymphal in some forms.....Tribe *Halobatini*.
9. (8.) Inner margin of the eyes accurately sinuate behind the middle; body comparatively long and narrow, abdomen long.
Tribe *Gerrini*.
10. (9.) Posterior femora not extending to the abdominal apex.
Subfamily VELIINÆ.

In the tribe Gerrini, thus far only one genus has apparently been recorded east of the Mississippi and north of Georgia. This is the genus *Gerris*, consisting of three subgenera held by some authors to be genera. The characters of the tribe as given above will serve to distinguish the genus, and the following key will help to separate the subgenera:

Genus **GERRIS** Fabricius.

1. (6). Pronotum sericerous, dull, antennæ comparatively short and stout.
2. (5). First joint of the antennæ shorter than the second and third taken together.
3. (4). Antennæ as long as half the body; sixth abdominal segment in the ♂ roundly emarginate.
Subgenus **Limnoporous** Stål.
(One species, *Gerris* (*Limnoporus*) *rufoscutellatus* Latreille.
4. (3). Antennæ not as long as half the entire length of the insect, not extending beyond the thorax; sixth abdominal segment in ♂ doubly emarginate.
Subgenus **Gerris** s. str. (= *Limnotrechus* Stål).
5. (2). First joint of the antennæ longer than the second and third taken together.
Subgenus **Aquarius** Schell. (= *Hygrotrechus* Stål).
6. (1). Pronotum glabrous, shining; antennæ long and slender.
Subgenus **Limnogonus** Stål.

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(Only one species of this genus, *Gerris* (*Limnogonus*) *hyalinus* Fabr. is recorded from the United States. It extends south from Florida throughout South America.)

Key to subgenus GERRIS S. str. (= *Limnotrechus* Stål).

1. (2.) Sixth abdominal segment acutely produced into a spine, comparatively slender species, is found mostly apterous. **canaliculatus** Say.
2. (1.) Sixth abdominal segment not spinously produced, stouter species, mostly winged.
3. (4.) Anterior margin of pronotum with a flavous line; second emargination of sixth ♂ segment roundly rectangular, ♀ genital segment comparatively broad; connexivum dark. **buenoi** Kirk.
4. (3). Anterior margin of the pronotum concolorous; second emargination of sixth ♂ segment narrow and rounded; ♀ genital segment comparatively narrow, connexivum flavus. **marginatus** Say.

Key to subgenus AQUARIUS Schell. (= *Hygrotrechus* Stål).

1. (2.) Comparatively stout species, generally apterous; legs short; underside of body dark; spines of sixth abdominal segment not reaching end of genital segment.....**remigis** Say.
2. (1.) Comparatively slender, generally winged; legs long; underside of body yellowish; spines of sixth segment reaching end of genital segment .....**conformis** Uhler.

Key to tribe *Halobatini*.

1. (6.) First antennal joint much shorter than the other three taken together; not much longer than the second and third taken together, and sometimes shorter.
2. (5,) Fourth (apical) joint longer than third.
3. (4.) Eyes larger, fairly prominent; colors black and yellow; lacustrine species.
   Genus **Trepobates** Uhler (= *Stephania* F. B. White).

(One species thus far recognized, of great distribution, *Trebobates pictus* H. S.)

4. (3.) Eyes small, widely separated; plumbeous forms, entirely sericeous; oceanic forms.....Genus **Halobates** Esch.

(Thus far, one species only appears to have been found on our coasts, *H. micans* Esch., which at times is found on the Florida beaches.)

5. (2.) Fourth (apical) joint never more than equal to third; basal joint of anterior tarsi much shorter than second; hind femora equal to or much shorter than hind tibia and tarsus taken together.....Genus **Rheumatobates** Bergr.

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6. (1). First antennal joint nearly equal to the remaining three taken together, much longer than second and third; antennæ almost as long as entire body; hind femora twice as long as hind tibia.....Genus **Metrobatos** Uhler.

(The one species thus far ascribed to this genus is *M. hesperius* Uhler.)

Key to Genus Rheumatobates Bergroth.

Males.

1. (2.) Hind femora and coxæ curiously swollen and distorted. **rileyi** Bergr.
2. (1.) Hind femora and coxæ simple.....**tenuipes** Meinert.

Both Sexes.

1. (2). Mesosternum yellow, unicolorous.....**rileyi** Berg.
2. (1.) Mesosternum yellow with the anterior margin and the two posterior diverging bands brownish-black, these bands not reaching to the posterior margin and dilated near the anterior margin.....**tenuipes** Meinert.

Gerris (*Aquarius*) **remigis** Say; 1832, Descr. Het. Hem., p. —; 1859, Compl. Writings, i, 362.

The tables for subgenera and species will make the determinatien of this form certain, but any doubt that might arise can be at once set at rest by means of Thomas Say's original description. This is perhaps the most common of our species and one of the most widespread too, at least so far as the area under discussion is concerned. It is to be found most frequently on running waters, although it also frequents still, but to a less extent. The winged form is very rare and is seldom seen in collections. They congregate in groups in shady, slow-moving parts of streams, at the tree roots projecting from banks into the water, in the shadow of bridges, and in general in almost any place where they have some shelter from the burning rays of the summer sun. They pass the winter as adults, hibernating under boards or logs or in other sheltered places near the waters they frequent. From the earliest days of spring, as soon as the ice is melted, they can be found in warm nooks and sheltered coves busily mating. The eggs are laid along the edges of grasses or other leaves growing under water but near the surface, to which they are fastened by a waterproof glue. They hatch out in

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about three weeks, according to the temperature, and after five molts reach the adult or perfect stage in some four weeks more. In the favorable conditions of heat, food and moisture ruling in an aquarium, the period of development is probably at a minimum. Their food consists of such insects as have the misfortune to fall into the water, on which they pounce and after rendering them unconscious by means of their narcotic saliva, they feast at their leisure. Both young and adults are parasitized by a bright red mite.

This species ranges from Labrador and British Columbia south into Mexico and east of the Rocky Mountains. Thus far it has been reported from the following States: Maine, New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Illinois, Michigan, Texas, Colorado, Arizona, Oregon, California, North Carolina, Georgia, Louisiana, etc. It seems to be very widespread, but we have no actual records other than those cited.

Gerris (*Aquarius*) **conformis** Uhler; 1878, Proc. Boston Soc. Nat. Hist., xix, p. 435.

The long produced abdominal processes of this form separate it sharply from its congener *G. remigis*, and the generic characters given in the tabe differentiate it from *G. rufoscutellatus* with which it might be mistaken. Further differences between it and *remigis* are the comparatively longer form, decidedly longer legs, more prominent eyes, etc. So far as my experience goes, it is distinctly an inhabitant of flowing waters, where its very long legs attract attention and make it recognizable even at a distance. In this latitude I have never seen it in the short-winged or wingless form, although I have specimens (brachypterous) from Louisiana. Apparently nothing is known of its life history, but it is carnivorous like the other Gerrids. Its range extends at least to Louisiana.

Gerris (*Gerris*) **marginatus** Say; 1832, op. c., p. — (Fitch reprint, p. 807); 1859, Compl. Writings, i, p. 362.

This small stout form is an abundant inhabitant of our lakes and ponds, where it preys on other insects. Like its larger cousin *remigis*, it hibernates as an adult, and begins to

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mate in early spring. The white cylindrical eggs hatch after some ten days or two weeks, the rapidity of the transformation depending on temperature and humidity. There are in this species also five nymphal instars, and the life cycle is in the neighborhood of five or six weeks. It ranges practically over the entire continent, from Canada into Mexico, where I have taken it.

Gerris (*G.*) **buenoi** Kirkaldy; 1911, Ent. News, vol. xxii, p. 246.

This species has been frequently confounded in collections with the preceding one. It is, however, much smaller, and very easily separated from *marginatus* by the genital structure and flavescent pronotal margin. It also frequents still waters, but is far more uncommon than the preceding. So far nothing seems to be known of its life-history, but doubtless it could be easily worked in aquaria. Its range, to my certain knowledge, is from British Columbia down to New Jersey.

Gerris (*G.*) **canaliculatus** Say; 1832, op. c., 807; 1859, op. c., 363.

This form, rather rare in the North becomes more abundant as we go South. It frequents still ponds, and even when at large its slim body and long antennæ distinguish it from its relatives *marginatus* and *buenoi*. The long antennæ also bring it near to the Central American species of the subgenus. Its chosen haunts are secluded little coves and bays in ponds, where it paddles quietly about seeking its prey. Owing to its scarcity it is not possible to say much definitely as to its hibernation or breeding habits. The ova, however, are similar to those of the other species of the genus, and the period of hatching and development vary but little from the others observed, The nymphal stages are five. In this species I was able to raise about thirty individuals from ova deposited in my aquaria, all the progeny of one *apterous* female, and *every one was macropterous*. This female was taken swollen with ova, which she deposited in my aquarium to the number of about thirty, which left her quite slim once more. She deposited three or four more similar batches, and although there was no male with her, *all* were fertile. This species

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is mainly Southern, and, as noted above, not very abundant about New York.

Gerris (*Limnoporus*) **rufoscutellatus** Latreille; 1807, Gen. Ins., iii, p. 134.

Excepting the oceanic forms, this is perhaps the most widely distributed of the *Gerrids*, and excepting the parasitic forms, one of most universal of the Heteroptera, saving perhaps *Nezara viridula*. It is a dweller in still waters of whose habits little is known beyond what is familiar of the other members of the genus, such as its carnivorous habits. Nothing is is known of its life-history, and unlike the other species, it is scarcely ever seen in the wingless form. About New York it is not uncommon, mainly in shallow marshy pools, but its life-history still remains to be worked out. This species extends throughout the holarctic region, from Western Europe to the Eastern United States. Its most Southern distribution in the East known to me, is North Carolina, and in the West is Colorado, the former record being from a specimen in the U. S. National Museum collection, and the other from the Colorado Agricultural Experimcnt Station at Ft. Collins.

Tribe HALOBATINI.

We now pass to the tribe *Halobatini* which presents a series of forms of a totally different facies. The general impression these species produce is of shortness and breadth of form as compared to the *Gerrini* which are long and narrow. In fact, Bianchi used this comparative ratio of the length and breadth to distinguish the two tribes (in his arrangement considered as subfamilies), but Bergroth employes the more scientic character of the outwardly curved inner margins of the eyes in the *Halobatini* in contradistinction to the partly excavate ones in the *Gerrini*.

Metrobates hesperius Uhler; 1871, Proc. Bost. Soc. Nat. Hist., xiv, p. 108.

This is a species which like most of the other members of the tribe, is lacustrine to a very great extent, and it may be seen congregated in large patches of blackness on the smooth

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waters of our lakes, or perhaps in the wide reaches of slow moving streams. It is a very active species, and skips and jumps in pursuit of its prey, or perhaps in playfulness. Very little is known about it beyond the fact that it extends from Canada at least as far south as South Carolina. It commonly occurs in the apterous, but the winged form seems not rare under favorable conditions. The nymph of this species together with that of *Rheumatobates* were described by Ashmead as *Halobatopsis bęginii.*

Trepobates pictus H. S.; 1848 (?), Wanz. Ins., viii, p. 111, figs. 882, 883.

Here we have the most common and widespread species of the tribe, another dweller on the tranquil bosom of the lakes, where it skims solitary far from the shores or congregates in little shoals in some friendly sheltering cove, both young and old in one group. The winged form, very rare in this latitude, has a most peculiar (and to the collector, annoying) habit of breaking off its wings for about half their length, thus leaving several of the abdominal segments exposed, a trick which is not limited to one sex only. Judging from aquarium breedings, unlike the *Gerrini* known to me, the eggs are glued fast in masses embedded in a transparent glue, and in nature are probably attached to some solid object at the edge of the water. In due course the white eggs grow darker and hatch; the young nymph casts its skin five times before attaining its full growth in some five weeks or so. It ranges from Canada to Central America, in whose tropical climate the winged form is far more abundant than with us.

Rheumatobates rileyi Bergroth; 1892, Ins. Life, iv, p. 321.
Rh. tenuipes Meinert; 1895, Ent. Medd., p. 7.

In these two species we have two of the most peculiar of the water-striders. The female shows no striking peculiarities of structure, but the males in both (as well as in all the other species of the genus) have most peculiarly formed and distorted antennæ, which have all the appearance of being designed for prehensile organs. Thus far I have been unsuccessful in discovering their peculiar function, but should

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not be surprised if they had some connection with the mating habits of the insect and were employed in seizing the female antennæ during the act. *Rh. rileyi* also breaks off its wings, and in this form there is a well defined line of weakness across the hemelytra. In this species the middle legs in the male are most peculiarly distorted, this furnishing the most reliable character by which to separate it from *tenuipes*, in which they are straight and simple. Being rather shy and inconspicuous, and looking much like the nymphal stages of some larger form, they have not been much collected, so *Rh. tenuipes* has thus far been recorded only from the District of Columbia, together with *rileyi* which, however, is also known from New York and New Jersey. Nymphs from Quebec Prov., Canada, were included in his types of *Halobatopsis bêginii* by Ashmead. The known distribution of these two species is too limited to be real, and doubtless careful collecting will add them to other faunas. And here I would like to give to my late esteemed friend the Rev. J. L. Zabriskie the credit that is his due for his most interesting discovery and first description, unfortunately without a name, of the form known later as *Rh. rileyi*, named by Dr. E. Bergroth, who recognized its novelty, after the great American entomologist who referred it to him for study. This is a very fair example of the reasons on which I base my distaste for naming species after individuals. Is there not also a *Gerris* named after me by a dear friend? Yet all my share in this was to send him for study some specimens received under another label from my other good friend, E. P. Van Duzee, whose, after all, is the real credit for having recognized it as new.

Returning now "to our muttons," we come to that fascinating group which contains

Halobates micans Esch.; 1823, Nat. Ah. Dorp., i, p. 163 (=*wüllerstorffi* Frauenfeld; 1867, Verh. zool.-bot. Ges. Wien., xvii, p. 458; F. B. White, 1883, Rep. Chall. Exp., Zool., pl. 1, f. 2. [all the other descriptions are also to be found in this work]).

This form is included, because although not as yet recorded from the North Atlantic Ocean, it is not uncommon on the

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Florida beaches, cast there by stormy wind and wave, and may some summer day be found on our own coasts. This, the type genus of the tribe, is a purely oceanic form, and has been taken hundreds of miles from the nearest land, but it also has been found among the Florida keys. Females have been found with the extruded eggs attached to the abdomen, and the Vitor Pisani expedition picked up a floating feather on which were some red eggs, which judging from an examination of the embryo, were ova of Halobates. How they brave the oceanic tempests, how they breed, what they eat, are all mysteries befogged by speculation. This tiny being contributes to biology one of those problems which form its fascination for those who love that science.

I have set forth in the preceding pages, very briefly, perhaps *too* briefly, an outline of what is known regarding these most remarkable forms, in the hope that by enabling others to recognize them, our knowledge of their habits, their life-histories and their distribution may be greatly enlarged.

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Descriptions of North American MYMARIDÆ with Synonymic and Other Notes on Described Genera and Species.

BY A. A. GIRAULT.

The Mymaridæ of North America have been so long neglected that it need not seem startling or surprising when I make the statement that the following pages comprise practically all of our known forms the great majority of which are described for the first time. This paper is based on material obtained from various collections, more especially those of the Illinois State Laboratory of Natural History, the Milwaukee Public Museum, the British Museum of Natural History and the United States National Museum. By far the largest part of the material and that of most value was from the latter collection. Museums have never had large collections of this family; that of our national museum, consisting of several hundred specimens, was and is undoubtedly the largest one of the family existing within a public institution, with the possible exception of certain European museums (that of the Königl. Zoologische Museum, Berlin, for instance); it is the most valuble collection, however, being definitely arranged and excellently preserved, whereas that of other institutions is unarranged and scattered.

I should not, however, omit one other source of material, namely my own efforts. During the past several years, I have brought together the largest collection of these minute insects ever before obtained and in the State of Illinois have found practically all of our forms represented. This collection combined with that of the National Museum forms the basis then for whatever results are shown here.

My own experience indicates that the genera of the Mymaridæ are few but each tolerably rich in species. Some of the latter are very numerous in individuals, widely distributed, as animals obviously very successful. In one or two instances, I have thought that a few of our species were

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identical with European forms but so far the evidence seems to indicate that our fauna as represented by members of this family is quite distinct from that of other continents.

Family MYMARIDÆ.

Subfamily GONATOCERINÆ.

Tribe Ooctonini.

Genus OOCTONUS Haliday.

1. **Ooctonus longipes** Ashmead.

As shown beyond, this species is a *Polynema;* there are no valid species of this genus in North America.

Genus CAMPTOPTERA Foerster.

1. **Camptoptera pulla** Girault.

An additional female specimen of this extremely small mymarid was taken from the window of a horse stable at Litchfield, Ill., July 13, 1910.

Tribe Gonatocerini.

Genus GONATOCERUS Nees.

1. **Gonatocerus dolichocerus** Ashmead. Ashmead, 1887, p. 192. Normal position.

Female.—Length, 1.50 mm. Large for the genus. General color dark brown, the abdomen lighter at base and at the incisions of the abdominal segments giving it a striped appearance, the legs and antennæ concolorous but of the former, the trochanters, both ends of the femora and tibiæ are lighter, pallid yellowish and the cephalic legs and tarsi are lighter throughout but not as light as the trochanters and tips of femora and tibiæ; distal tarsal joint concolorous with thorax or the femora and the fourth tarsal joint somewhat darker than the others. Venation about concolorous with the general body color; antennæ uniform in color. Fore wings uniformly distinctly, though lightly, fumated from the apex proximad nearly to the end of the long marginal vein (or practically the whole blade distad of the venation). Posterior wings hyaline. Eyes dark.

Fore wings moderately broad, regular in shape, the margins of the blade about parallel, the apex regularly rounded, broadest at the base of the distal fourth, more than half the distance from apex of venation to the apex of the blade; the edges of the blade dusky along the distal half; fore wings about three and one-half times longer than broad, their discal ciliation uniform, moderately dense (estimated about from 25 to 30 longitudinal lines across the widest portion of the blade), extending proximad to base of marginal vein. Marginal ciliation of the fore wing usual but short, the longest not half the length of the

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marginal vein, only about a tenth as long as the greatest wing width, the longest about thrice the size of the discal cilia and not any longer (subequal) than those of the posterior margin of the hind wings. Marginal vein very long for the genus, about twelve times longer than wide, about a fourth shorter than the slender submarginal vein, moderately broad, distad leaving the cephalic wing margin and terminating like a stigmal vein, the independent portion moderately short, curved concavely (its cephalic margin concave), the whole comprising about a fourth the length of the marginal vein and at its base there are two equal pustular (clear) spots in a line transversely and three more in its apex; if treated as a stigmal vein it would be a moderately long, distinct one, without a knob and ending in an obtuse point. Posterior wings curved, acuminate, the apex acute, its discal ciliation consisting of a double row of cilia along each edge, the outer row more or less obscure, its cilia inclined outward, and distad three more or less regular rows, two short, not containing more than five or six cilia, the third (caudal) one longer, coming down the wing blade irregularly to its extreme base, crossing over before reaching the venation; or the first and second of these lines may be equal in length, not extending far proximad but much longer than the third; there are a few additional minute cilia proximad, caudad and disto-caudad of the venation. The latter straight, long, slender, slightly widening at tip. Marginal cilia like those of the fore wing, the longest subequal to the greatest width of the blade (across the apex of the venation).

Legs normal, the tarsi 5-jointed, the proximal tarsal joint much the longest but barely equal to any two of the others combined excepting the fourth and fifth, the distal four sebequal, the fourth a little shorter than the others; tibiæ all slender and longer than the femora; coxæ large. Cephalic tibial spur long, slender, curved and forked at tip, forming a strigil and as long as the proximal tarsal joint (cephalic legs); other tibial spurs single, straight, shorter; trochanters 2-jointed. Cephalic proximal tarsal joint armed beneath with a row of stiff bristles. Caudal coxæ conical. Posterior femora moderately stout.

Abdomen ovate, about equal in length to the head and thorax taken together, sessile, the ovipositor reaching to tip, not exserted, only its tip projecting slightly. Metathoracic spiracle minute, round. Body apparently without sculpture and with no conspicuous pubescence.

Antennæ 11-jointed, filiform-clavate, moderately pubescent with short grayish hairs. Bulb of scape slender, moderately long, straight. Scape slightly longer than pedicel and first and second funicle joints combined, about as long as the first three funicle joints together, slightly convexed beneath; pedicel short obconic, wider but not much longer than the proximal funicle joint; the latter shortest, distinctly longer than wide, cylindrical; funicle joint 2 longer and stouter; 3, 4 and 5 subequal, slightly longer and wider, 6 and 7 subequal, a fourth shorter, stouter, wider than long, about equal in length to 1 but dis-

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tinctly stouter; funicle 8 rectangular, slightly shorter than 6 or 7, but still longer than wide; club ovate, moderately slender in one aspect, in the other moderately stout, equal in length to the three joints preceding when combined, pubescent, the setæ short and in one aspect, apparently with a large number of glandular pores grouped along the whole length of that aspect (in reality, dense minute hairs); also with a few short, curved, longitudinal sulci, arranged in pairs.

From 4 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Redescribed at first from four female specimens in the United States National Museum collection labelled "2793[01]. Par. in eggs of *Ceresa bubalus*. March 10, '87. From W. W. Thompson, Smithville, Ga." The original specimen of this species has since been found in the U. S. National Museum collection on a tag labelled in Ashmead's handwriting "*Gonatocerus dolichocerus* Ashm., Jacksonville, Fla." It has been remounted and designated on the type .*

Habitat.—United States: Smithville, Georgia; Jacksonville, Florida; Anna, Illinois.

Types.—Type No. *13,664*, United States National Museum, Washington, D. C., 1 female in xylol-balsam (Florida). *Homotypes.*—Four females in xylol-balsam, 1 slide (1 perfect specimen + 3 imperfect ones), deposited in the collections of the Illinois State Laboratory of Natural History, Urbana, Illinois (Accession No. *44,216*).

This species is similar to *Gonatocerus anthonomi* Girault described from the same general locality but differs in being decidedly more robust, more particularly in having a marginal vein of the fore wing which is about a fourth longer than in that species and in having broader fore wings. From the species *americanus* Brues it differs, according to the description of that species, in having much longer proximal funicle joints of the antennæ, the first two taken together

* Subsequently, a female specimen has been found in the collections of the Illinois State Laboratory of Natural History, mounted on a tag numbered *3681*; it was captured by sweeping in a strawberry field at Anna. Ill., July 31, 1883 (H. Garman); it has somewhat narrower fore wings. Remounted in balsam,

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being decidedly longer than the pedicel, not so in *americanus;* also in general coloration. This is the first species described from North America but a number of other undescribed forms are known to me, most of which I describe beyond.

I have since examined the type of *Gonatocerus americanus* Brues through the ready kindness of Dr. S. Graenicher of the Milwaukee Public Museum and through the courtesy of the director of that institution and it is found to differ further from this species in being smaller, much less robust, in having a shorter proximal tarsal joint of the posterior legs, a shorter marginal vein of the fore wings and narrower fore wings; also the posterior wings are narrower and the mid-longitudinal line of discal cilia is short and distad. The species *americanus* is closely allied with *anthonomi* but differs from it in being darker (a minor characteristic here), in having the first three funicle joints of the antennæ unequal, about equal in *anthonomi* and by lacking the yellowish streaks on the mesoscutum. The diagnostic table of the North American forms of this genus, in which is included the following new species, will aid, I hope, in making the characteristics of all of the species stand out more clearly. The fifth North American species to be discovered is described herewith, upon which the descriptions of other common species are given.

2. **Gonatocerus rivalis** species nova.

Normal position.

Female.—Length, 1.00 mm. Moderate in size for the genus and with the usual habitus but more slender and graceful, the ovipositor together with its valves exserted for about a fourth or more of the length of the abdomen.

Black, the base (nearly basal third) of the abdomen contrasting by being pallid yellowish, yellowish brown or chrome yellow or orange. Base of the valves of the ovipositor (at the tip of the abdomen), intermediate and posterior coxæ and trochanters, tarsi, cephalic trochanters and posterior femora (the latter nearly) concolorous with base of the abdomen; antennal scape and pedical varying by being suffused more or less with pallid, especially ventrad on the scape, the remaining portion of the antennæ black; knees and tips of the tibiæ more or less pallid as are also most of the cephalic tibiæ; distal tarsal joint in-

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clined to be darker, so at extreme tip. Venation pallid dusky. Fore wings distinctly fumated especially distad (distal half of that portion of the blade distad of the apex of the venation); posterior wings nearly similarly fumated but the more distinct fumated area is still farther distad. Eyes dark. Mandibles dark fuscous. Ovipositor yellowish.

Abdomen sessile, as long as the head and thorax combined, conic-ovate, the valves of the ovipositor exserted as stated, the exserted portion subequal in length to the antennal club, clavate (broadening distad and somewhat paddle-shaped), appearing somewhat flattened (depressed), nearly as long as the femora. Parapsidel furrows complete, narrow, widely separated. Body bearing widely scattered, stiff setæ. Metathoracic spiracle minute, round. Body without marked sculpture. Mandibles short, falcate, bluntly acute at apex.

Fore wings oar-shaped, moderately narrow for the genus, graceful for the genus, nearly uniformly ciliate discally (20 to 24 longitudinal lines at the widest blade portion), the discal ciliation moderately dense (the longitudinal lines difficult to count), distinctly denser distad, caudad bounded by a straight row of cilia running proximo-cephalad, obliquely across the wing, to the base of the marginal vein where the discal ciliation ends in a point. Marginal ciliation of the fore wing moderately short and usual for the genus, the longest cilia not quite as long as a fourth of the greatest wing width and distinctly not as long as the longest marginal cilia of the posterior wing. Marginal vein long and slender, distad leaving the costal margin, inclined obliquely. Posterior wings narrow, only slightly wider across the apex of the venation than the average width of the blade, acute at apex, narrowing gradually distad, without midlongitudinal discal ciliation but the two paired lines of cilia along each edge present as usual in the genus, the posterior paired line the more conspicuous; its marginal vein clavate slender, bearing a row of rather close-set, short setæ (about 10); the marginal cilia moderately long, somewhat over twice longer than the blade is wide at its middle; posterior wings much shorter than the fore wings.

Legs normal, tarsi 5-jointed, the proximal joint longest but not long; tibial spurs single, straight, short, rather stout, but those of the cephalic legs longer, curved, forked at apex and forming the usual strigil; trochanters 2-jointed; cephalic and posterior femora somewhat thickened; tibiæ all slender, longer than the respective femora; legs clothed with stiff setæ but not densely.

Antennæ 11-jointed, slender, the club slender, the flagellum filiform. Scape long, cylindrical, slightly convexed ventrad, including the bulbs equal to the club in length and as long as the pedicel and next two joints taken together. Pedicel usual, slightly longer than the proximal funicle joint, as broad as the scape. Funicle peculiar by reason of the fact that it bears joints alternately long and short; the proximal funicle joint is longer than wide but shortest, subequal however to 6; joints 2 and 3 of the funicle are subequal, nearly a half longer, longest but

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each subequal to 5; 4 shorter, 5 longer, 6 still shorter than 4, a third shorter than 5, a fourth than 7; the latter again longer and 8 again shorter, a fifth shorter than 7 and consequently somewhat longer than than 6; club joint long and only slightly wider than the funicle, as long as funicle joints 2–4 combined, longer than the three preceding joints taken together, bearing four or five short, curved, longitudinal grooves. Antennæ clothed with moderately short, soft, grayish pubescence on the funicle, somewhat shorter on the club and which is too dense to be arranged in distinct rows transversely or to be whorled.

From 4 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Described beyond.

Described from four female specimens mounted in balsam and all captured by the sweeping net as follows: One female captured by Mr. C. A. Hart and myself while sweeping along the edge of a cypress swamp, Pulaski, Illinois, May 14, 1910; a single specimen of the same sex captured by myself while sweeping along the edges of a brooklet running between an old orchard in sod and a cedar grove at Butler, Illinois, July 14, 1910; and two females captured in the same spot, July 21, 1910.

This species is interesting not only because of its foreign aspect and gracefulness but because it is very probably parasitic on the eggs of some aquatic insect as its habitat and structure would lead one to infer. It is also of interest because it either mimics or else is mimiced by an eulophid which I captured at the same time at Butler and mistook for specimens of this insect, and of whose difference I did not suspect until all of the specimens had been examined under the microscope. The eulophid has the same habitus and the same general coloration, the contrasting pale coloration of the base of the abdomen especially aiding the likeness of the two; it is a tetrastichine allied with *Syntomosphyrum* Foerster.

Habitat.—United States: Butler, Vienna and Pulaski, Illinois; Riley County, Kansas; Arlington, Virginia.

Type.—Type No. *13,679*, United States National Museum, Washington, D. C., one female in xylol-balsam (Butler, Ill., July 14). *Cotypes.*—Accession No. *44,212*, Illinois State Laboratory of Natural History, Urbana, Illinois, three females in xylol-balsam, 2 slides (the 3 remaining specimens).

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I have since found a single tagmounted specimen of this species in the collections of the United States National Museum labelled "*Gonatocerus basilaris* Ashm. ♀. Riley Co., Ks., F. Marlatt, Nov. 9. 2204. 1407." It has been remounted in balsam and deposited in the same collection. In dried specimens of this species, the ovipositor is likely to be withdrawn some distance toward the base of the abdomen and thus to appear non-exserted. This was the case with another specimen of this species captured by myself at Vienna, Illinois, October 12, 1910, on the windows of a stable. Still another female has been found subsequently in the collections of the National Museum mounted on a tag labelled "Arlington, Va." Thus this species is doubtless widely distributed in the United States.

What is undoubtedly the male of this species was found in the collections of the U. S. National Museum, mounted on a tag but with no labels. It is described herewith.

Male.—Length, 0.60 mm. Smaller and more slender than the female, the antennæ longer than the body, the abdomen depressed, ovate. Antennæ 13-jointed, filiform, slender. Flagellum joints moderately long, about four and one-half times longer than wide, the distal and proximal joints subequal, a fourth shorter than any of the others which are subequal, all longitudinally striate. Pubescence soft, sparse hairs. Femora stout. Otherwise as in the female.

From 1 specimen, same objective and optic.

The type *Gonatocerus anthonomi* Girault is a single tagmounted specimen of each sex; I have seen four other paratypical specimens of the species, three of them originally tagmounted, all now in xylol-balsam. From the three tagmounted specimens it was learned that on the metathorax there are two lateral longitudinal carinæ, one on each side of the spiracle but neither close to it, one being near the meson, the other nearly in the lateral aspect. The sculpture is scaly reticulation. The four paratypes* were reared at the same time with the types. The species is common in Illi-

* One of these paratypes, a female mounted on a slide, has been deposited as accession No. *44,240* in the collections of the Illinois State Laboratory of Natural History; and a male homotype, Urbana, Ill., May 30, 1910 as accession No. *44,218* of the same collection.

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nois. I have captured both sexes of it with the sweeping-net at Urbana (July 1, 1910) and on the windows of a greenhouse in the same place (May 17, 31 and October 19, 1910); also Butler, Illinois, July 14, 1910 on stable windows (1 ♀).* These specimens were somewhat lighter than the typical Georgia specimens, somewhat olivaceous, somewhat smaller and with slightly narrower fore wings. The yellow streaks on the scutum were distinct.

The type of *americanus* Brues is a single female mounted in xylol-balsam (formerly tagmounted) labelled "*Gonatocerus americanus* Brues. ♀. 22,256. Type. Milw. Co., Wis. VI-8, 1906." It may finally turn out to be *anthonomi* which it certainly resembles very closely in structure. The male antennæ in *anthonomi* have the funicle joints longitudinally striated.

The following new species—*brunneus*—is closely allied with *anthonomi* and *americanus*, but differs by its pure brown ochre color and structurally in having more slender antennæ and in being smaller and more graceful. Otherwise it is certainly difficult to distinguish between these three species, though they appear to be distinct.

3. **Gonatocerus brunneus** species nova.

Normal position.

Female.—Length, 0.75 mm. Moderately small for fhe genus.

The same as the species *americanus* and *anthonomi* in general structures.

General color uniformly brown ochre, the legs and antennæ concolorous, the tips of tibiæ and the tarsi more pallid. Wings uniformly, slightly, infuscated, their ciliation brownish; intersegmental spaces of the abdomen lighter in color. Scape with a pallid ring just distad of the apex of the bulb.

Fore wings with the longest marginal cilia longer than any of the proximal tarsal joints, but not more than a fourth of the greatest wing

* Also at Centralia, Illiois, August 25, 1909, 1 female on the window of a shed on a farm. And from the U. S. National Museum collections: one female labelled "Crevecoeur. Onaga, Kans. 412"; one female labelled "Oswego, N. Y., August 4, 1896". The species must be widely distributed in the United States. Subsequently, a female in the same collection labelled "*Gonatocerus websteri* Ashm. ♀. Ohio. 1705".

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width; posterior wings with the usual paired rows of discal ciliation around the edges of the blade and centrally a short midlongitudinal line running from the apex and containing about from 8 to 10 cilia. Proximal tarsal joints not long but longer than any of the other four, moderately long.

Antennæ slender, the funicle subclavate; scape together with its rather long bulb equal in length to the combined lengths of the pedicel and first four funicle joints, slender, slightly thickened in the middle. Pedicel usual, obconic, distinctly longer than either of the first four proximal funicle joints, but slightly shorter than any two of them combined, wider than the scape or any part of the funicle; first four funicle joints subequal in length, slightly longer than wide, small, slender, but 3 and 4 of funicle subequal in size, wider than 1 and 2; funicle 5 is abruptly longer, twice the length of 3 or 4, cylindrical, wider, about equal to pedicel in length; 6 is shorter and somehat narrower than 5, but a third longer and wider than 3 or 4; 7 of the funicle larger, somewhat longer and wider than 5, the longest funicle joint; 8 is slightly broader than 7 but shorter than 5 or 7, a fourth longer than 6. The club is slender, long-ovate, as long as the three preceding joints combined, shorter than the scape. It bears a few longitudinal grooves.

From 2 specimens, $\frac{2}{3}$-inch objective, 1-inch obtic, Bausch and Lomb.

Male.—The same but lighter in color, the base of the abdomen above, intermediate femora and fore part of thorax beneath, cream yellow; flagellar joints strongly striated longitudinally, concolorous with body.

From 2 specimens, the same magnification.

Described at first from two female specimens found tag-mounted in the U. S. National Museum collections labelled simply "Ind". They have been remounted in balsam. This species is similar to English specimens in my possession labelled *Gonatocerus flavus*, but for the present I consider them distinct.

Habitat.—United States: Indiana; Illinois (Urbana, Mattoon, Centralia).

Types.—Type No. *13,803*, United States National Museum, Washington, D. C., two females in xylol-balsam (1 slide, Indiana). *Cotypes.*—Accession No. *44,237*, Illinois State Laboratory of Natural History, Urbana; one female in xylol-balsam (Urbana, Illinois).

Subsequently, the following specimens: Captured at Ur-

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bana, Illinois, in sweepings, two males, May 25, 1910, on greenhouse windows, one female, May 23, 1910; at Centralia, Illinois, the form described below, one female, August, 1909, on a window; at Mattoon, Illinois, two females together on the window of a horse stable, July 16, 1910.

There is a color variety of this species, at first thought to be distinct from it but since considered the same, as both forms agree structurally; this variety agrees with *aureus* in color. It is described herewith.

Gonatocerus brunneus tenuipennis varietas nova.

Normal position.

Female.—Length, 0.65 mm. Moderately small for the genus.

The same as *brunneus*, differing in being somewhat lighter in color, the thorax, head and base of the abdomen pale cadmium yellow, the rest of the abdomen dusky brown, in being smaller in size and primarily in having somewhat more slender fore wings; the antennæ are olive greenish and differ from those of *brunneus* in not having the sixth funicle joint quite so distinctly shorter than the joint immediately preceding and following it. Its legs are uniformly concolorous with the body or a shade lighter. The marginal cilia of the fore wings are equal to a third of the greatest width of those wings. The posterior wings are very narrow, and bear no discal ciliation in the midlongitudinal line.

Antennæ like those of *brunneus;* funicle joints 5, 6 and 7 subequal, nearly equal to the pedicel in length, twice the size of 3 or 4, 8 a fourth shorter. The club large, ovate, abdomen short, triangular.

From 2 females, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from a single female specimen captured on a window in a woodshed on a farm at Centralia, Illinois, August, 1909, and another by sweeping, Urbana, July 1, 1910.

Habitat.—United States: Centralia, Urbana, Illinois.

Type.—Accession No. *44,214*, Illinois State Laboratory of Natural History, Urbana, Illinois, one female in xylol-balsam (Centralia, Ill.).

4. **Gonatocerus aureus** species nova.

Normal position.

Female.—Length, 0.80 mm. Moderately small for the genus.

Belonging in the same group with *americanus* and *anthonomi* and differing from them in being pale cadmium yellow in color, colored in

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fact like *brunneus tenuipennis*, primarily in having the fourth funicle joint over half as long (two-thirds as long) as the fifth (twice longer than wide), much longer than the third, not so in either *americanus* or *anthonomi* (nor *brunneus*) where the fourth funicle joint is not more than half as long as the fifth and distinctly not over twice longer than wide; it differs from *tenuipennis* as can be inferred from what has been stated by having the somewhat broader fore wings, and in antennal structures, *tenuipennis* having the fourth funicle joint short, no longer than the third or but very slightly longer and only about half as long as the fifth funicle joint. Otherwise it is the same as *brunneus tenuipennis*. Antennal scape and pedicel, however, somewhat more yellowish than the dusky olive-green flagellum.

Antennæ 11-jointed; first two funicle joints subequal, longer than wide, but not very much so; funicle 3 longer by a fourth, one and one-half times longer than wide, funicle 4 still longer, twice longer than either 1 or 2, subequal in length to pedicel, slightly over twice longer than wide, very slightly enlarged; funicle 5 about a third longer, stouter, longest joint of the funicle; 6 and 7 subequal, slightly wider and shorter; 8 slightly wider, shorter than 7, slightly longer than 4. Scape slender. Proximal tarsal joints moderately long.

From 3 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from three female specimens in balsam, captured by sweeping miscellaneous vegetation, Urbana, Illinois, July 27, 1910, and at Du Bois, Illinois, June 23, 1910.

Habitat.—United States: Urbana, Du Bois, Illinois.

Type.—Accession No. *44,215*, Illinois State Laboratory of Natural History, Urbana, Illinois, one female in xylol-balsam (on a slide with *Polynemæ* and other mymarids); type locality, Urbana, Illinois.

5. **Gonatocerus maximus** species nova.

Normal position.

Female —Length, 1.35 mm. Large for the genus.

Similar in general to *dolichocerus* Ashmead but agreeing also with *nigritarsis* Ashmead by reason of antennal structures but falling in between these two species. It agrees more with the former especially in coloration and in the shape of the fore and posterior wings, but the proximal three funicle joints of the antennæ are shorter, agreeing in this respect nearly with *nigritarsis*. Coloration like that of *dolichocerus;* fore and posterior wings similar to those of that species, the marginal vein similar; antennæ differing in having the first and second funicle joints about equal, each distinctly shorter than the pedicel,

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the second slightly longer than the first, each also distinctly shorter than the third funicle joint by at least a third; moreover the third funicle joint is shorter than the pedicel and distinctly longer by a fourth than funicle 4; thus funicle joint 4 instead of being subequal to 3 and distinctly longer ihan the pedicel, is shorter than both. The proximal tarsal joint of the caudal legs is shorter than in *dolichocerus*. From *nigritarsis* this species differs in antennal structures by having the fourth funicle joint shorter than the third; its posterior wings are much broader and the coloration of the legs and venation much darker.

From 1 specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from a single female specimen captured at Pulaski, Illinois, May 14, 1910, by sweeping along the edges of a cypress swamp (C. A. Hart and A. A. Girault).

Habitat.—United States: Pulaski, Illinois.

What is perhaps the male of this species was found in the collections of the U. S. National Museum mounted on a tag labelled "27 July, 1894. Ithaca, N. Y."

Type.—Accession No. *44,217*, Illinois State Laboratory of Natural History, Urbana, Illinois, one female in xylol-balsam (the female specimen in foregoing).

6. **Gonatocerus fasciatus** species nova.

Normal position.

Female.—Length, 1.05 mm., mean. Large, the fore wings broad, the color brown-black or fuscous. Ovipositor not exserted.

The same as *maximus* and *dolichocerus* but differing from both in having a distinct transverse fascia crossing the wing proximad from the end of the marginal vein. In agrees with the former in having the posterior wings not so broadened across the apex of the venation, but differs from it again in having the proximal funicle joints longer as in *dolichocerus* yet more slender and shorter than in that species. At first the species was mistaken for the last-named species. It is similar to that species in all structures excepting as pointed out. Moreover, it agrees in having the long marginal vein and in general coloration, excepting the fascia on the fore wings. From the species *nigritarsis*, the fourth species of the large, robust Gonatoceri, it differs in its darker legs, the longer marginal vein of the fore wings and proximal antennal joints and the broader blade of the posterior wings. The following details are all that it is considered necessary to add:

Fore wings with about thirty (or more) longitudinal lines of discal ciliation across their widest blade portion, crossed at the end of the

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marginal vein by a distinct transverse fuscous fascia which is obliqued somewhat proximo-caudad; posterior wings acute at tip, almost abruptly, with but one or two cilia in the midlongitudinal line of the blade near apex, sometimes several more farther proximad; the longest marginal cilia of the posterior wing are distinctly longer than those of the fore wing, slender, about twice longer than the mean width of the blade.

Proximal funicle joint of antennæ twice longer than wide, barely shorter than the pedicel; funicle joints 2 and 3 subequal, a fourth longer, each distinctly longer than the pedicel, yet not very much longer, still slender; 4 somewhat longer and a little stouter than the preceding joint; 5 stouter but about of the same length as 4, subequal in length to 3, cylindrical; 6 and 7 distinctly shorter, subequal, cylindrical-ovate; 8 still shorter. The club usual. Pubescence as in *dolichocerus*.

From 3 specimens, $\frac{2}{3}$-inch objective. 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from three female specimens, two of which were found in my personal collection labelled "Arlington, Va., July 6"; the third specimen was found in the National Museum collections and was labelled "Washington, D. C., office window. C. N. Ainslie, Collector."

Habitat.—United States: Arlington, Virginia, and the District of Columbia.

Type.—Accession No. *44,238*, Illinois State Laboratory of Natural History, Urbana, Illinois, two females in xylol-balsam, 1 slide (Arlington, Va.).

7. **Gonatocerus novifasciatus** species nova.

Normal position.

Female.—Length, 1.05 mm. Large for the genus.

The same as *fasciatus* but the stripe across the proximal part of the fore wings is broader and less regular and situated somewhat farther distad, just beyond the apex of the marginal vein, not embracing that apex or just before (proximad) it, as in the other species. Also the marginal vein of the fore wings is decidedly shorter and the proximal funicle joint also, instead of being twice longer than wide and over three-fourths the length of the pedicel, is subquadrate, barely longer than wide (if not wider than long) and not half as long as the pedicel. The posterior wings also differ in having a single midlongitudinal line of discal cilia which is complete, extending far proximad. Moreover the legs and antennæ are decidedly darker, uniformly very in-

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tense dark brown, only the trochanters and three intermediate tarsal joints being lighter, the former suffused with pallid, the latter pallid lemon-yellow. The scape is somewhat more dilated. Otherwise as in *fasciatus*. Metathorax apparently bicarinate at the meson.

Antennæ 11-jointed; scape as long as the pedicel and first three funicle joints combined; pedicel twice the length of the proximal funical joint; funicle joint 2 twice longer than 1, slightly shorter than the pedicel; 3 twice longer than 2 and decidedly broader; 4 and 5 subequal, somewhat shorter (4 slightly shorter than 5), somewhat stouter; 6 and 7 subequal, somewhat shorter than 4; funicle 8 still shorter, slightly longer than 2 but much wider. Club long, as long as the combined lengths of joints 3, 4 and 5 of the funicle. Pubescence usual.

From 1 specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from a single female specimen mounted on a tag, found in the collections of the United States National Museum, Washington, D. C., and labelled simply "Tenn." The specimen has been remounted in xylol-balsam.

Habitat.—United States: Tennessee.

Type.—Type No. *13,804*, United States National Museum, Washington, D. C., one female in xylol-balsam.

8. **Gonatocerus maga** species nova.

Normal position.

Female.—Length, 0.95 mm. Moderate in size for the genus; ovipositor exserted.

Similar in appearance to *rivalis* but differing in color—the base of the abdomen is not conspicuously colored with yellow or yellowish but the body is black, the abdomen brownish-black, darker in the middle; the venation of the fore wings is darker, the fore wings themselves with the longest marginal cilia somewhat shorter than those in *rivalis;* the legs are more uniformly dark, the antennæ uniformly black and differing in structure—thus the sixth funicle joint is not distinctly shorter than the joint immediately preceding and that following, but is subequal in size to the latter, distinctly broader than the preceding joint and fully as long; further, in this species, the widening of the funicle is distinct at the fifth joint, more gradual in *rivalis;* the second and third funicle joints in *rivalis* are longer than in this species. Again the fore wings are not pronouncedly fumated at the distal portion of the blade but very slightly uniformly fumated throughout with the exception of the usual clear, rectangular space proximad, under the submarginal vein. The exserted valves of the ovipositor are some-

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what shorter in this species and uniform in color. The posterior wings differ in that in the midlongitudinal line from the apex there is a single line of cilia (seven or eight cilia). Proximal tarsal joints longer than in *rivalis*.

Trochanters, knees and tips of tarsi pallid; tip of abdomen suffused more or less with pallid; posterior wings hyaline, their longest marginal cilia much longer than those of the fore wing. Otherwise as in *rivalis*.

Antennæ 11-jointed. Proximal and distal funicle joints shorter the latter slightly longer and distinctly broader, ovate; both slightly shorter than the pedicel; funicle widening distinctly at joint 5; 2 slightly longer than 1, subequal in length to the pedicel; 3 and 5 longest, 4 slightly shorter than 3; 6 slightly shorter than 5, subequal to 7. Club equal to joints 2, 3 and 4 of the funicle, similar to that in *rivalis*.

From 1 specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from a single female specimen captured on the window of a stable at Litchfield, Illinois, July 13, 1910.

Habitat.—United States: Litchfield, Illinois.

Type.—Accession No. *44,239*, Illinois State Laboratory of Natural History, Urbana, Illinois, one female in xylol-balsam.

9. **Gonatocerus latipennis** species nova.

Male.—Length, 1.30 mm. Large.

Allied with *dolichocerus* but differing in having a somewhat broader fore wing with the marginal vein shorter than in that species; otherwise it is nearly similar, differing colorationally in that the trochanters and knees of the legs are less noticeably pallid and the wings perfectly hyaline. The fore wings at their widest blade portion bear about from forty-five fo fifty longitudinal lines of discal cilia (in *dolichocerus* only about from twenty-five to thirty-one or two); the posterior wings are nearly similar to those in the Ashmedian species, but their marginal cilia (caudal margin) are longer. Another noticeable difference (though which may be more apparent than real) is that in this species the discal ciliation of the fore wings terminates abruptly proximad before attaining the marginnl vein, thus the wing is naked caudad of the venation, whereas in *dolichocerus* this ciliation is projected triangularly proximad, the cilia being present caudad of the venation.

Antennæ 13-jointed, filiform, the joints of the flagellum cylindrical and longitudinally striate and with the exception of the discal joint, acute or spined at the disto-lateral angles. Scape and pedicel normal; first funicle joint very much longer than the small, triangular pedicel, somewhat shorter than the second funicle joint; the latter somewhat

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shorter than the third funicle joint, the first and second funicle joints being cylindrical ovate; funicle joints 3 to 10 cylindrical, subequal, about thrice longer than wide. Distal or club joint conic-ovate, slightly shorter than the preceding joint, long. Pubescence sparse,

From 1 specimen, ⅜-inch objective, 1-inch optic, Bausch and Lomb.

Female.—Unknown,

Described from a single male specimen found mounted on a tag in the United States National Museum collections and which bore the following labels: "13–5", "285" and in Ashmead's handwriting "*Gonatocerus atratus* Ashm."; "*Caraphractus harringtonii* Ashm." Remounted in xylol-balsam.

Habitat.—North America: (?) Canada.

Type.—Type No. *13,805*, United States National Museum, Washington, D. C., one male in xylol-balsam.

10. **Gonatocerus pygmæus** species nova.

Normal position.

Female.—Length, 0.60 mm.; small for the genus.

Allied with the species grouped with *anthonomi* and *americanus* and more especially with *aureus* and *brunneus;* it may be distinguished at once by means of the fact that the third funicle joint of the antennæ is somewhat lengthened, longer than the fourth and still longer than either of the two proximal funicle joints. In coloration it is similar to *anthonomi* but differs in having the base of the abdomen yellow. Fore wings slightly fumated throughout.

Fore wings with about from nineteen to twenty-three longitudinal lines of discal cilia across the widest blade portion, the discal ciliation fine and moderately dense, absent (with the exception of one or two cilia) in the shape of a small triangular clear space just out from the oblique limiting line of cilia which runs caudo-distad from the proximal end of the marginal vein (in the other, allied species, this area has five or more cilia in it, in some nearly as densely ciliate as the main portion of the blade). Marginal cilia of fore wings moderately short, the longest not quite a fifth the greatest wing width. Otherwise as in the allied species.

Antennæ normal; scape long and slender, nearly as long as the pedicel and first three funicle joints combined, slenderer at each end; pedicel obconic, distinctly larger than the first two funicle joints separately and as long as any of the funicle joints. Funicle joints 1 and 2 subequal, rectangular, 2 slightly longer; 3 subpyriform, enlarging somewhat distad, a third longer than 2 and a fourth longer than 4; the latter wider, cylindrical ovate; funicle joints 5 and 6 subequal to

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or slightly longer than 3, cylindrical; 7 slightly shorter and wider and 8 subequal to 6 but somewhat wider. Mandibles with three subequal, rather minute teeth. Sometimes funicle joint 3 longest, when, excepting the two proximal joints, the others of the funicle are cylindrical-ovate, subequal and shorter than 3, giving the funicle a more compact appearance.

From 5 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from five females on tags, now remounted in xylol-balsam, found in the collections of the United States National Museum, Washington, D. C., bearing this label: "Miss."

Habitat.—United States: Mississippi.

Types.—Type No. *13,821*, United States National Museum, Washington, D. C., four females in xylol-balsam, 1 slide. *Cotype.*—Accession No. *44,249*, Illinois State Laboratory of Natural History, Urbana, Illinois; one female similarly mounted.

11. **Gonatocerus texanus** species nova.

Normal position.

Female.—Length, 0.55 mm. Small in size for the genus.

Falling in the group containing *anthonomi* but differing from it and allies by possessing a shorter marginal vein of the fore wing and in being smaller; also the fore wings are more densely and finely ciliate, the discal ciliation finer and denser than with any species of the genus. The antennæ also differ in that the joints are all shorter.

General color dark brown, the venation and proximal three tarsal joints lighter brown; wings hyaline or very slightly fumated, more noticeable at the venation and proximad of it.

Fore wings moderate in width, with about from nineteen to twenty-two longitudinal lines of discal cilia, the latter short and fine, moderately dense, continuing caudad beneath the venation to the oblique limiting line of cilia; marginal cilia moderately short, only about a fourth of the wings greatest width; marginal vein only about six times longer than wide, moderately short, about as long as the united length of the proximal two tarsal joints. Posterior wings very slender, with the usual discal ciliation.

Parapsidal furrows complete; ovipositor not exserted. Vertexal carina present. Tibial spurs single, small, but those of the cephalic legs much larger, curved and forked, forming a strigil. Tarsal joints short, the proximal ones distinctly longer than the others, but only

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moderate in length, not long, rather short for this genus. Trochanters 2-jointed. Tarsi 5-jointed.

Antennæ 11-jointed; scape long and slender, its bulb long, the scape clavate, equal in length to the pedicel and first four funicle joints combined; pedicel usual; first three funicle joints subequal, barely longer than wide, each not half the length of the pedicel; joint 4 still small, slightly longer than 3; joints 5 and 6 subequal, each a fourth longer than joint 4, oval, distinctly shorter than the pedicel; joints 7 and 8 larger, subequal, over a third longer than joints 5 and 6, rectangular, nearly as long as the pedicel; 8 is somewhat shorter than 7. All funicle joints shorter than pedicel.

From 3 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from three female specimens remounted in xylol-balsam from tags in the United States National Museum collection, bearing the label "College Station, Tex. Sept. Banks. Alaptus ♀."

Habitat.—United States: College Station, Texas.

Types.—Type No. *13,823*, United States National Museum, Washington, D. C., two females in balsam, 1 slide.

12. **Gonatocerus californicus** species nova.

Normal position.

Female.—Length, 0.60 mm. Small for the genus.

Allied with *aureus* and its allies. Differing from *aureus* in that the second and third funicle joints of the antenna become lengthened and are longer than either the fourth or fifth, nearly twice longer than joint 1 of the funicle. Joints 2, 3, 4 and 5 of the funicle slender, each at least over twice its own width; excepting for general coloration, similar to *aureus*. It resembles *pygmæus* somewhat in color scheme but the fringes of the fore wing at the cephalic margin are twice longer in this species and the antennæ differ.

General color very dark brown, the base of the abdomen marked with golden orange; scape, pedicel, trochanters, knees and proximal four tarsal joints pallid. Legs and antennæ brownish. Wings slightly, though distinctly, uniformly fumated. Venation dusky brownish.

Fore wings with the marginal vein moderate in length, about eight times longer than wide, the ciliation usual for the group of species to which it is allied, excepting that the marginal cilia along the cephalic margin of the fore wing are longer than usual, nearly equal to those of the caudal margin. Posterior wings very slender, bearing no discal cilia other than the paired line along each margin, their marginal cilia as long as those of the fore wing (but very short on cephalic margin).

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Ovipositor not exserted; tarsal joints short; strigils present. Antennæ with the second and third funicle joints subequal to or slightly longer than the pedicel; funicle joints 4 and 5 shorter, 4 somewhat shorter than 5, but either distinctly longer than the proximal funicle joint. Antennæ normal.

From 1 specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from a single female specimen remounted in xylol-balsam from a tag in the United States Museum collections, bearing the label "Siskiyou Co., Calif."

Habitat.—United States: California (Siskiyou Co.).

Type.—Type No. *13,822*, United States National Museum, Washington, D. C., one female in balsam.

13. **Gonatocerus mævius** species nova.

Normal position.

Female.—Length, 0.85 mm. Moderately large for the genus.

Allied with and resembling *maximus* from which it may be distinguished by reason of the fact that here the proximal funicle joints are all short, more especially the third funicle joint is shorter than the fourth, the joints gradually enlarging distad; also the marginal vein of the fore wing is shorter and the posterior wing is almost densely ciliate at the apex discally. The fore wings also are somewhat narrower. Otherwise as in *maximus*. The tarsi are pallid and the base of the abdomen inclined slightly that way. Discal ciliation of the fore wing fine and dense. Fore wings practically hyaline. Distal two funicle joints rectangular, largest, thrice the size of the second funicle joint but not much longer than the preceding joint.

From a single specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from a single female specimen from the collections of the Illinois State Laboratory of Natural History, Urbana, Illinois, collected by sweeping timothy and red clover, Normal, Illinois, May 10, 1884 (S. A. Forbes).

Habitat.—United States: Illinois (Normal).

Type.—Accession No. *1692*, Illinois State Laboratory of Natural History, Urbana, Illinois, one female in xylol-balsam (remounted from a tag).

The table to North American species of *Gonatocerus* follows.

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DIAGNOSTIC TABLE

of the North American species of *Gonatocerus* Nees—Males, Females.

I. Ovipositor not exserted. Species yellowish to brown through brownish-black to black. Fore wings variable, broad, moderate or comparatively narrow and without a fascia.

A. Fore wings very broad, with from forty-five to fifty longitudinal lines of discal cilia across their widest blade portion; only about twice longer than broad.

1. Marginal vein long; posterior wing across distal end of venation distinctly broader than the length of the longest marginal cilia of fore wing; dark brown, the wings hyaline (male). **latipennis** Girault.

B. Fore wings broad, with from twenty-five to thirty longitudinal lines of discal cilia across their widest portion; only about two and a half times longer than broad; marginal cilia of fore wing relatively short.

1. Posterior wings at apex of venation broadened, twice broader than the blade just before apex or broader than the longest marginal cilia of fore wing.

Marginal vein of fore wing very long, about twelve times longer than wide; proximal tarsal joint of caudal legs long; dark brown, legs dark; robust, second and third funicle joints distinctly longer than pedicel, each twice longer than wide. **dolichocerus** Ashmead.

2. Posterior wings at apex of venation not distinctly broadened, narrower than, or only as wide as, the longest marginal cilia of fore wing.

Second and third funicle joints of antennæ each twice longer than wide, each subequal to, or longer than, the pedicel; marginal vein of fore wing relatively shorter; dark brown, legs light yellow..... **nigritarsis** Ashmead.

Second and third funicle joints of antennæ each shorter, the second only a half longer than wide, the third longer than the fourth but distinctly shorter than the pedicel; legs dark brown .....**maximus** Girault.

Second and third funicle joints still shorter, the third shorter than the fourth, the joints gradually enlarging distad, none larger than the pedicel; fore wings somewhat narrower, the marginal vein shorter.....**mævius** Girault.

C. Fore wings narrower, with only from about twenty to twenty-five longitudinal lines of discal cilia across the widest blade portion and about thrice longer than broad; marginal cilia longer. Funicle joints 2 and 3 of antennæ only about one and a half times longer than broad, each distinctly shorter than the pedicel; posterior wing at apex of venation not broadened but normal.

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1. Species black, unmarked, proximal funicle joints uneven **americanus** Brues.
2. Species brownish black to olivaceous; an oblique, longitudinal pale streak along each side of mesoscutum; marginal vein of fore wing seven or eight times longer than wide. **anthonomi** Girault.
3. Species brown-black; unmarked on thorax; marginal vein of fore wing only about five times longer than broad. **texanus** Girault.
4. Species pure brown, small; antennæ slender. **brunneus** Girault.
5. Species pale cadmium yellow, the abdomen darker distad, the legs uniformly concolorous; joint 4 of funicle twice longer than wide, over half the length of joint 5....**aureus** Girault.
6. Species brown-black, the base of the abdomen yellow; third funicle joint of antennæ nearly as long as the pedicle and distinctly longer than joints 1, 2, or 4. Small; marginal vein of fore wing shorter.....**pygmæus** Girault.

II. Valves of the ovipositor distinctly exserted for some length; fore wings comparatively narrow and slender, or only moderately broad, without a fascia. Species deep black, marked with pale cadmium yellow or pallid. Abdomen long, conic-ovate, body more slender, graceful.

1. Antennæ slender, funicle joint 4 shorter respectively than either the one following or the one preceding; funicles 3 and 5 longest; posterior wing not wide across the apex of the venation, its marginal cilia long.

   Species black, base of abdomen distinctly marked with pale cadmium yellow or pale yellow as is also the base of the valves of the ovipositor; fore wings more distinctly fumated than usual; antennal scape and pedicel varying to pallid; proximal tarsal joint of posterior legs short. Funicle joints 2 and 3 long, longer than pedicel, subequal. **rivalis** Girault.

   Species wholly black, only the legs marked with pallid; proximal tarsal joint of posterior leg longer. Fore wings only very slightly uniformly fumated. Funicle joints 2 and 3 unequal, the latter longer but hardly as long as the pedicel. **maga** Girault.

III. Valves of ovipositor not exserted. Fore wings with a fascia.

1. A short brown fascia across wing just *before* apex of marginal vein; second funicle joint of antennæ longer than pedicel. Marginal vein long.....**fasciatus** Girault.
2. A short, somewhat broader fascia across wing slightly *beyond* apex of marginal vein; second funicle joint shorter than the pedicel; marginal vein shorter.....**novifasciatus** Girault.

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This table is based upon an examination of types or else the original specimens of all of the species. The species *dolichocerus* Ashmead and *nigritarsis* Ashmead (1887, pp. 192–193), were unrecognizable from their descriptions and I very nearly redescribed the former as new from other specimens of it before comparing them with the remounted original specimen. Both of them are very much alike but may be distinguished by means of the characters given in the preceding table of species. From the original specimen of *nigritarsis* I have taken the following additional descriptive notes, besides designating the specimen as type:

Brownish black, the legs nearly uniformly pallid lemon yellow, the posterior tibiæ and the tarsi brown. The fore wings are broad having from twenty-five to thirty-two longitudinal lines of discal cilia and are about two and a half times longer than broad. The marginal vein is yellow, long, but not so long as in *dolichocerus* and its free distal end is shorter than in the latter species. The posterior wing is slender, not considerably broadened across the apex of its venation, bearing the paired lines of discal ciliation along each margin but with no mid-longitudinal discal ciliation excepting a short line of from three to five cilia at the apex. Its marginal cilia along the posterior margin are longer than the longest marginal cilia of the fore wing; its blade is distinctly narrower than that of *dolichocerus*. The antennæ have the first and second funicle joints each distinctly shorter than the pedicel, taken together longer than it, the third funicle joint subequal in length to the pedicel or slightly shorter, the fourth joint slightly longer; funicle joints 5, 6 and 7 subequal, distinctly longer than 4, the distal funicle joint shorter, subequal to 4. The club is long. Scape broad, its bulb long, taken together as long as the club. Strigil of anterior legs present.

From 1 female, ⅔-inch objective, 1-inch optic, Bausch and Lomb.

The foregoing notes taken from the original specimen found in the collections of the United States National Museum on a tag labelled "*Gonatocerus nigritarsis* Ashm. Jacksonville, Fla." in Ashmead's hand. No number was connected with it.

Type.—Type No. *13,806*, United States National Museum, Washington, D. C., one female in xylol-balsam (the original specimen remounted).

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Oophilus Enock (1909, p. 458, pl. xv, figs. 1–6) = **Gonatocerus** Nees.

An examination made of a specimen of the type species of this genus shows that it is a Gonatocerus of somewhat peculiar habitus but no more so than that of *rivalis* Girault or *maga* Girault; moreover, it is wrongly described for the tarsi are not 4-jointed but 5-jointed. Mistaken in regard to tarsal structure, doubtless the author was thus mislead, The species is exactly as described with the exception of the essential difference just noted and the following: The ovipositor is not very long, that is to say, is not exserted for any length, but the valves are exserted as in *rivalis* and *maga*, that is distinctly, but not to any great extent (not to a length equal to the whole or a half that of the abdomen, for instance), in reality not even for a fifth of the length of the abdomen. The wings are those typical for *Gonatocerus* and similar to those in the broader winged species—*dolichocerus* Ashmead for instance. The antennæ are typical with the exception that the scape is minutely and densely serrated along its ventral edge (not the club as Enock states) as in some species of *Polynema* (*bifasciatipenne* Girault, *enockii* Girault, *howardii* Ashmead).* The species thus falls in the group containing *rivalis* and *maga* because of its shortly, though distinctly, exserted ovipositor and may be distinguished at once from either by its broad fore wings and longer distal funicle joints of the antennæ. Like the two American species it is black in color, marked slightly with yellow or pallid and has their comparitively long, conic-ovate abdomen, which, however, is not yellow at base; only the antennal pedicel, the proximal three or four tarsal joints, the knees, trochanters and tips of the tibiæ are yellowish. In the fore wing, the marginal vein is usual in length, not lengthened as in *dolichocerus*; these wings bear about forty longitudinal lines of discal cilia at the widest blade portion but they are distinctly narrower than those of *latipennis*, the discal ciliation denser. Both wings are hyaline.

* This serration occurs in the males of other species of *Gonatocerus*, some of the North American species, but I cannot give specific instances of it just at present. It also occurs in *Anaphes*.

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The foregoing notes taken from a single specimen, a female, remounted in balsam from a tag and received from Mr. C. O. Waterhouse; the specimen was labelled "*Oophilus longicauda* Enock. ♀. Richmond, Eng. 7. 9. 10. C. O. Waterhouse." The name of the species is now *Gonatocerus longicauda* (Enock).

Genus **ALAPTUS** Haliday.

1. "**Alaptus pallipes** Ashmead."

As was shown elsewhere, this species was generically lost. Its position is definitely fixed beyond, where it is placed with *Anaphes* and redescribed. It has been captured in Illinois.

Genus **LITUS** Haliday.

1. **Litus armatus** Ashmead.
   Ashmead, 1887, p. 193.

An examination of the original specimen of this species shows that the tarsi are 4-jointed and that the insect has anaphine affinities. It is doubtless one of the common species of *Anagrus* but at present I am unable to place it.

In Ashmead's handwriting the specimen was simply labelled "Litus armatus Ashmead, Jacksonville, Fla. Type." and no number was attached to the specimen. It is quite as described but the wings are now missing.

Further examination of this specimen shows that it is an Anagrus. Furthermore, the species is common in Illinois and varies considerably in color. It is a very beautiful form and has characteristic wing shape and antennæ, and thus may be easily recognized.

In order that this recognition may be possible and easy in the future, I have made extensive descriptive notes beyond, describing at the same time a color variety of the species. These notes are taken from the specimens mentioned in the place intimated as having been captured in Illinois.

Subfamily MYMARINÆ.

Tribe **Anaphini.**

Genus **ANAPHES** Haliday.

The only difference between this genus and *Anagrus* Haliday, so far as I am able to see, is that described for the male

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antennæ; the venation does not differ. As considered here, using the structure of the males, the species of *Anaphes* are usually black, of *Anagrus* yellow; in the former, the fore wings wider and less graceful. The two genera may have to be combined.

1. **Anaphes pallipes** (Ashmead).

Alaptus pallipes Ashmead, 1887, p. 193.

Alaptus pallipes Ashmead, Girault, 1908, p. 186; 1910, pp. 243–244.

Further careful examination of the original specimen of this species shows that it is undoubtedly a species of *Anaphes*, though I have never seen the species in Illinois;* the original specimen has one pair of wings missing and the distal antennal joints, but I believe the species can be recognized again. It is closely related to *iole* Girault† in being similar in general appearance and in having the fine discal ciliation of the fore wings but the legs are wholly pallid and the antennæ differ in regard to the relative shape and size of the joints. Although Ashmead states in the original discription that the antennæ are 8-jointed, which would indicate its position to be in the genus *Anthemis* Howard, yet it so closely resembles an *Anaphes* that until other specimens of it are found I believe it best to leave it here.

Since writing the above I have an undoubted specimen of it from Illinois and so make the following notes. The species is correctly placed unless it should prove to be an *Anagrus*, a fact which cannot be known until the male is discovered.

Female.—Length, 0.50 mm. Small for the genus.

Similar to *iole* but smaller and with differently colored legs; the antennæ differ structurally in having the fourth funicle joint short and rounded-ovate, not more than a fourth longer than wide and distinctly shorter than either the preceding or following joint, subequal to joint 2 of the funicle; in *iola* this is not so—the fourth funicle joint is about twice longer than wide, cylindrical ovate, less distinctly shorter than either the preceding or following joint, distinctly longer and wider than funicle joint 2; in *iole* the funicle joints are decidedly longer

* See the next paragraph.

† Described beyond.

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throughout than in this species. The two species also agree in the shape, discal ciliation and general appearance of the fore wings, the discal ciliation in both species being moderately fine and short, not coarser as in the other species; there are about from ten to twelve longitudinal lines in this species (a few more in *iole*). The naked, rectangular space on the fore wing out from the apex of the marginal vein and along the cephalic margin is about the same in both species and is longer than the marginal vein. The marginal cilia of the fore wings are long, but the longest are distinctly shorter than the greatest width of the fore wing but not a great deal shorter. The posterior wings are curved and without discal ciliation other than the paired lines along each edge. They are distinctly shorter than the fore wings; their longest marginal cilia slightly over twice the width of the blade of the posterior wings. Hooklets three, very minute. Tibial spurs minute, single. Proximal tarsal joints short, subequal to any of the others but somewhat longer and stouter on the cephalic legs. Thorax long, ovipositor concealed, the valves forming an acute point to apex of abdomen. Legs and antennæ dusky to pale. Black. Fore wings fumated slightly out as far as the end of the venation.

From 2 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Redescribed from the remounted original specimen found in the collections of the United States National Museum, mounted on a tag and labelled "*Alaptus pallipes* Ashm. Type. Jacksonville, Florida." and from a single female specimen captured on the pane of a window in an old pig-shed on a farm at Centralia, Illinois, September 2, 1909.

Habitat.—United States: Centralia, Illinois and Jacksonville, Florida.

Type.—Type No. *13,807*, United States National Museum, Washington, D. C., the original specimen in xylol-balsam. *Homotype.*—Accession No. *44,225*, Illinois State Laboratory of Natural History, Urbana, Illinois, one female in xylol-balsam.

The original specimen has the distal two antennal joints missing and all wings excepting one fore wing.

2. **Anaphes mellicornis** Ashmead.

Ashmead, 1887, p. 194.

This species is wrongly placed as concerns family, because it is a true Proctotrypid; its habitus and essential structure

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serve to place it at once. Also, its posterior wings are not Mymarid in structure; otherwise it agrees in general appearance with *Anaphes* and were it not for its essential structures could easily be mistaken for a member of that genus. For the present, I leave it unplaced. Its antennæ are but 8-jointed, its tarsi 5-jointed, other characters which preclude its position here.

3. **Anaphes gracilis** Howard.

Howard, 1881, p. 370, pl. xxiv, fig. 6.

Elsewhere (Girault, 1911 *b*) I redescribed this species and recorded it from Illinois; its original specimen has never been found but the antennal structure is characteristic. The species may be an *Anagrus*, but until the male is known it had better be left with this genus. Ashmead (1887, p. 194) gives the habitat of this species as California but that is a mistake and Smith (1910) records it from New Jersey, it is evident not from actual specimens. However, the species should occur in New Jersey at least. In Girault (1911 *b*), a typographical error occurs in giving the accession number of a specimen of this species in the collections of the Illinois State Laboratory of Natural History; its number is *44,221* and not *42,221;* also the specimen was captured in 1909. Its type number in the United States National Museum is *2620*.

4. **Anaphes sinipennis** species nova.

Normal position.

Female.—Length, 0.60 mm. With nearly the habitus of *Camptoptera* Foerster. Moderately small to small for the genus. Characterized by deep black color and curved, rather narrow fore wings and a strange, foreign aspect for the genus (Cf. its structural details).

General color uniformly, deep black, the antennæ and legs lighter, smoky or dusky black, the scape and pedicel suffused slightly with yellowish; resembling somewhat *Anaphoidea pullicrura* Girault. Fore wings distinctly uniformly but not pronouncedly fumated (dusky) but clear under the proximal half of the marginal vein and with a line of minute white dots along each edge. Posterior wings similarly fumated throughout and with a row of small clear dots along the posterior edge of the blade. Venation dusky. Eyes and ocelli inconspicuous.

Fore wings narrow for the genus and curved as in the genus *Camptoptera* Foerster, nearly, the caudal margin concave, cephalic margin

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broadly convex; their greatest width is at the distal three-fourths and is narrower than the length of the longest marginal cilia; the discal ciliation is coarse but uniform and is arranged only in about from five to seven longitudinal lines; along each margin very fine and short cilia are interspersed between the long, primary marginal ciliation; proximad, the discal ciliation of the fore wing is limited by an oblique line of cilia as in *Anaphoidea* which crosses the wing caudo-distad from about a point at the proximal two-thirds of the marginal vein. Proximad of this line, the wing is naked excepting for the presence of a single, distinct seta, centrally situated at the base of the marginal vein. Marginal cilia of the fore wing where longest (disto-caudad) one and a half times longer than greatest width of the blade, slightly longer than the longest cilia of the posterior wing and about sixty around the whole blade. Marginal vein long, about four and a half times longer than broad, its distal end free, concaved, ending in an obtuse point projected disto-cephalad. Fore wings ending in an obtuse point. Posterior wings narrow, curved slightly in a direction opposite to that of the fore wings, the cephalic margin broadly concave; acuminate, subacute at apex; its caudal marginal cilia long, much longer than the greatest width of the fore wing, at least four times longer than the average width of the blade of the posterior wing, those of the cephalic margin short, yet longer than the greatest width of the blade. Its discal ciliation consisting only of the *paired lines along each edge*, absent in the disk; two small hooklets. Marginal vein of fore wing bearing rather numerous setæ, irregularly placed (about nine to ten).

Thorax much larger (about twice) than the abdomen, the latter sessile, small, ovate, the valves of the ovipositor not conspicuous. Legs with the cephalic tibiæ short, slightly shorter than the cephalic femora, the intermediate and caudal tibiæ slender, distinctly longer than their respective femora. Tarsi 4-jointed, the proximal joints short, the others shortening distad but the proximal joint in the cephalic tarsi is twice larger than the second joint of those tarsi and bears a strigil; tibial spurs of cephalic tibiæ single, curved, comparatively large, forked at tip; those of the other legs *paired* (?) *and extremely minute*, apparently absent.

Antennæ 9-jointed, with a solid club. Scape somewhat longer than the pedicel and first two funicle joints combined; pedicel obconic, very much larger than the proximal funicle joint and longer than all funicle joints excepting the second, third and sixth, to either of which it is subequal in length; funicle joints 1, 2 and 3 slender, 4 and 5 and 6 thickening distad; 1 minute, barely longer than wide; 2 longest, slender, three and a half times longer than 1; 3 slightly shorter and very slightly thicker; 4 still shorter, thicker, cylindrical ovate; 5 slightly longer and thicker and 6 widest, longer, as long as joint 3 or even 2 (2 and 3 sometimes equal); 6 still narrower than the pedicel; club

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abruptly larger, nearly twice wider than the pedicel, ovate, with longitudinal grooves and as long as the combined lengths of the three proximal funicle joints. Along the whole of one side are grouped white dots, apparently setigenous spots, and in other aspects seen to be minute stiff setæ. Pubescence rather long, soft hairs on funicle, very short on club and closer.

From 3 specimens, ⅔-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from two female specimens captured by sweeping grass, Urbana, Illinois, July 1, 1910, and a third on a stable window at Litchfield, Illinois, July 23, 1910.

Habitat.—United States: Urbana and Litchfield, Illinois.

Types.—Accession No. *44,224*, Illinois State Laboratory of Natural History, Urbana, Illinois, two females in xylol-balsam (1 slide carrying miscellaneous mymarids). Type locality, Urbana, Illinois.

5. **Anaphes nigrellus** species nova.

Normal position.

Female.—Length, 0.75 mm. Moderately small but robust, short and stout. Fore wings moderate in width, not curved.

General color Van Dyke brown to blackish; the antennæ and legs dull olivaceus, the trochanters and knees pallid; the eyes very dark; wings fumated as in *sinipennis;* coxæ exteriorly somewhat darker.

Fore wings not curved, moderate in width, their greatest width subequal to their longest marginal cilia, their discal ciliation moderately fine and dense, arranged in from ten to twelve longitudinal lines across the widest blade portion and limited proximad as in the former species. Marginal vein as in the former species; distad just before apex, caudal margin of fore wing nearly straight, the cephalic margin convex. About sixty-five marginal cilia. Posterior wings as in *sinipennis* but slightly more curved and wider, bearing the usual paired line of discal ciliation along the caudal edge of the wing but that of the cephalic edge is single after it reaches half-way to the venation; its longest marginal cilia are subequal in length to the longest of the fore wings or slightly shorter, and they are about three times longer than the average width of the blade. Posterior wings nearly as long as the cephalic ones. The secondary marginal ciliation present in the fore wings. In the midlongitudinal line of the posterior wing is a line of from four to ten discal cilia running from the apex.

Abdomen globate-ovate, smaller than the thorax, sessile, the valves of the ovipostor not at all prominent or exserted. Tibial spurs minute, single (?), those of the cephalic legs larger, two-tined at tip and form-

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ing the usual strigil; the four tarsal joints about equal but in the cephalic tarsi, the proximal joint is distinctly longer than the others but none are long, though all longer than wide.

Antennæ moderately densely pubescent, 9-jointed, the club solid; scape usual, moderately long; pedicel obconic, shorter than any of the funicle joints excepting the first which is usual and minute, quadrate; funicle filiform or nearly, very slight enlargement distad, the five distal joints cylindrical, moderately long, the second shortest, three or more times longer than the first, a fifth shorter than the third and somewhat narrower; joints 3, 4, 5 and 6 of the funicle subequal in length and width, slightly shortening distad, 3 and 4 slightly the longest funicle joints. Club not very broad, long ovate, slightly longer than the combined lengths of the two preceding joints.

From 1 specimen, ⅔-inch objective, 1-inch optic, Bausch and Lomb.

Described from a single female specimen which flew into a small laboratory dish of xylol on a table in the Natural History Building, University of Illinois, Urbana, Illinois, June 26, 1909, and which was captured and mounted by Mr. J. D. Hood to whom the author is indebted for the specimen. Also subsequently another female captured in a greenhouse at Urbana, October 19, 1910, This specimen is decidedly darker all over, colored like *sinipennis* and the wings are more deeply fumated but otherwise I can not distinguish between them. A third female has been captured, together with *sinipennis* on a stable window, July 13, 1910, Litchfield, Illinois.

Habitat.—United States: Urbana, Litchfield and Chicago, Illinois.

Type.—Accession No. *44,228*, Illinois State Laboratory of Natural History, Urbana, Illinois, 1 female in xylol-balsam, Urbana. *Cotype.*—Cat. No. *13,808*, United States National Museum, Washington, D. C., 1 ♀ similarly mounted, same locality.

Amongst some miscellaneous Hymenoptera turned over to me for identification by a member of the Department of Biology of the University of Chicago, I have found an undoubted specimen of a male of this species in a vial of alcohol labelled "University of Chicago. Allen. 554": within the vial was a label as follows: "Geo. D. Allen. 8. 10. 09.

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Stony Is. 554." The male is similar to the female with the exception of the secondary sexual characters. The antennæ are normal, 12-jointed, the first funicle joint is twice the length of the pedicel, subequal to the distal joint; other flagellar joints a fourth or more longer than the first or last one, moderately long and slender, longitudinally striated.

6. **Anaphes iole** species nova.

Normal position.

Female.—Length, 0.75 mm. Moderately small for the genus.

Differing from the species of the type of *nigellus* in having a longer, more slender thorax, hence a more slender body and in having the fore wings broader, with less curvature in either margin, the apex more rounded and the discal ciliation finer, not as long or coarse. The body hence like that of *gracilis* and *pallipes*, less hump-backed than with *sinipennis* and *nigrellus*, the fore wings also less fumated, more clear. The species like *pallipes* Ashmead, excepting as has been or will be noted.

General color black, suffused with some brownish; end of the marginal vein, the pedicel in places, the trochanters, tips of femora and tibiæ pallid, the rest of the legs, venation and antennæ dusky. Fore wings clear, excepting all that portion proximad of the venation. Posterior wings hyaline.

Thorax long, the abdomen shorter, but conic-ovate, sessile, the ovipositor not exserted. Legs as in the preceding species. Mandibles with three weakly indicated sinuations.

Fore wings as in *pallipes* but slightly broader (about fourteen longitudinal lines of discal cilia at the widest blade portion), the longest marginal cilia subequal to but slightly shorter than the greatest wing width. Posterior wings, a single line cephalad, a paired line caudad of discal ciliation, the latter apart some distance and in the disk a line containing about four cilia each far apart from the other in the line, and the first some distance proximad from the wing apex. Longest marginal cilia of the posterior wings slightly shorter than those of the fore wing. In the fore wing, discal ciliation absent proximad of the usual oblique limiting line running out from the marginal vein. Marginal vein distinctly shorter than the naked area just distad of it but about four and a half times longer than wide.

Antennæ 9-jointed, normal. Pedicel six or seven times larger than the small subquadrate proximal funicle joint, subequal to or slightly longer than joint 2 of the funicle, but very much broader, obconic; second funicle joint next shortest of the funicle, two and a half or three times longer than joint one, slender yet widening somewhat distad; funicle joint 3 longest of the funicle, a third longer than 2 and distinctly not so slender; 4 and 5 subequal, cylindrical-ovate, broader, a

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fifth shorter than 3; 6 still somewhat shorter and broader, yet still longer than 2; club solid, moderately short, only as long as the two preceding joints and not much broader, ovate. Pubescence light, scattered, but more or less in whorls. Scape thickened ventrad, moderate in length.

From 1 specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from a single female specimen mounted in balsam and captured at Urbana, Illinois, on greenhouse windows, April 30, 1910 (A. A. Girault).

Habitat.—United States: Urbana, Illinois.

Type.—Accession No. *44,241*, Illinois State Laboratory of Natural History, Urbana, Illinois, one female in xylol-balsam.

7. **Anaphes hercules** species nova.

Normal position.

Female.—Length, 0.93 mm. Large for the genus.

This is the largest species yet seen from North America but is not large as a mymarid. It is similar to *nigrellus* but differs as follows: The fore wings are broader, bearing about fifteen longitudinal lines of discal ciliation at their widest blade portion, the marginal vein is comparatively very long, longer for instance than the naked area distad of it, the posterior wings bear along their midlongitudinal line two lines of discal cilia of about from six to ten cilia each, running from the apex but unequal and they are somewhat more acute at apex. Otherwise, they are alike. The posterior wings are barely shorter than the fore wings.

From 1 specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from a single female specimen captured on the glass sides of a greenhouse at Urbana, Illinois, June 8, 1910 (A. A. Girault).

Habitat.—United States: Urbana, Illinois.

Type.—Accession No. *44,242*, Illinois State Laboratory of Natural History, Urbana, Illinois, one female in xylol-balsam (mounted with a female of *Polynema consobrinus* Girault and a Gonatocerus).

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8. **Anaphes cinctiventris** species nova.

Normal position.

Female.—Length, 0.80 mm. Moderate in size for the genus.

Allied with and resembling *Anaphes gracilis* Howard but differing as follows: Larger, the antennal joints all of the same shape but longer, the wings are decidedly longer and broader, their discal ciliation sparse and absent proximad as in *gracilis* but there are about from thirteen to fifteen longitudinal lines, instead of about from ten to eleven; it differs more especially in having the funicle joints of the antennæ less quadrate, for instance the distal funicle joint is over twice longer than its greatest width (at apex); in *gracilis* it is hardly more than one and a half times longer; the penultimate funicle joint in this species is distinctly longer than wide, but in *gracilis* it is about as wide as long or subquadrate at least. Colorationally this species differs from the other in having the legs and antennæ decidedly darker, only the trochanters, knees, second and third tarsal joints pallid; the tarsal joints are all decidedly longer, especially the proximal joint. The antennal scape is very long, nearly a half longer than with *gracilis* and nearly as long as the funicle.

General color black, the base of the abdomen yellow. Second and third tarsal joints, knees and trochanters pallid, suffused with more or less dusky, the distal tarsal joints pallid dusky, the proximal tarsal joints brown or concolorous with the legs, but those of the cephalic and intermediate legs are paler. Antennæ concolorous, uniform in color. Fore wings fumated only proximad, across the venation. Venation pallid.

Thorax long and slender, longer than the abdomen; the latter sessile, the ovipositor not exserted. Otherwise as in *gracilis*.

From 1 specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from a single female specimen in the U. S. National Museum collection on a tag labelled "E. H. Ehrhorn. Mtn. View, Calif. 663°. Iss. 27 June, '95". Remounted in xylol-balsam.

Habitat.—United States: California (Mountain View).

Type.—Type No. *13,809*, United States National Museum, Washington, D. C., one female in xylol-balsam.

This species is closely allied with (*Erythmelus*) *Anagrus goochi* Enock, recently (Enock, 1909, pp. 454–455, pl. XIII, figs. 6–10) described from England (Wales) but through the great kindness of Mr. C. O. Waterhouse I have been able to

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compare specimens of the two. They differ in that *goochi* has the legs all pale, the distal funicle joint of the antennæ longer, the fourth and fifth funicle joints subequal, the fourth not longer than the fifth as in the American species; also in the British species the abdomen is longer, the intermediate femora more slender. The species, hence, is probably an Anagrus like *gracilis* Howard.

ERYTHMELUS Enock (*l. c.*) = **Anagrus** Haliday.

Unfortunately, this recently described genus in my estimation is not separable from *Anagrus* Haliday. It is true, its type species has a peculiar habitus, but the essential characters are those of the old genus.

ENASIUS Enock (1909, p. 456, pl. XIV, figs. 1–5) = **Anagrus** Haliday.

The same I think may be said of this genus. It is essentially *Anagrus* and its type species resembles *Anagrus goochi* (Enock) but the wings are slenderer and more densely ciliate, the scape and other antennal joints longer.

Diagnostic Table of the North American Species of *Anaphes* Haliday—Females. (Cf. Table for *Anagrus*.)

I. Fore wings sparsely ciliate, the discal cilia absent along most of the proximal half of the blade and not limited proximad by a distinct oblique line of cilia running caudo-distad from the venation; funicle joints quadrate, cuneate or rectangular, truncate distad, not exceeding to any extent the length of the pedicel, the proximal joints short, quadrate, the joints enlarging distad reciprocally. Species black with base of abdomen yellow, the wings hyaline.

1. Fore wings broad (about 12 lines of cilia); distal funicle joint twice longer than broad; fourth funicle joint twice longer than broad; longest marginal cilia of fore wing somewhat shorter than the greatest wing width; proximal tarsal joints of caudal legs moderately long and slender. Legs dusky. **cinctiventris** Girault.

2. Fore wings narrower (about 8 lines of cilia); distal funicle joint only one and a half times longer than broad; fourth funicle joint barely longer than broad; longest marginal cilia of fore wings slightly longer than the greatest wing width; proximal tarsal joint of caudal legs shorter; legs pallid. **gracilis** Howard.

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II. Fore wings densely ciliate, the discal cilia extending uniformly proximad beneath the venation and limited there by a distinct oblique line of cilia which runs caudo-distad from a point near the base of the marginal vein; funicle joints of antennæ longer, cylindrical to cylindrical ovate, joints 2 and 3 longest, as long as or longer than the pedicel, the joints not successively enlarging distad. Species usually wholly black, the fore and posterior wings usually fumated.

1. Fore wings slender and curved, the marginal cilia distinctly longer than their width (nearly twice longer), the discal cilia arranged only in about six or seven lines.

Wholly black; fore wings fumated with the exception of a rectangular clear area under the marginal vein proximad; funicle joints 2 and 3 subequal, slender, about as long as the pedicel or somewhat longer.....**sinipennis** Girault.

2. Fore wings broader, not curved, the marginal cilia not any longer than the greatest wing width, the discal cilia arranged in more than six or seven lines.

Fourth funicle joint of antennæ not much longer than wide, not much more than a half as long as the third.

Proximal tarsal joints short; third funicle joint cylindrical-ovate, longest; black, legs and antennæ dusky yellowish. **pallipes** Ashmead.

Fourth funicle joint of antennæ twice longer than wide, at least two-thirds the length of the third or subequal to it.

Third funicle joint cylindrical, longest, a fourth longer than the fourth joint; blade of the fore wing mostly hyaline, the cilia fine. Posterior wings hyaline, without a distinct row of white dots along the caudal margin...**iole** Girault.

Third funicle joint cylindrical but scarcely longer than any of the following funicle joints; fore wings clouded throughout, the discal ciliation more distinct; posterior wing fumated, with a distinct row of white dots along the caudal margin.

Fore wing with the marginal vein shorter than the naked area distad of it; fore wings with 12 lines of cilia. **nigrellus** Girault.

Fore wing with the marginal vein longer than the naked area distad of it; fore wings with about 15 lines of cilia. **hercules** Girault.

Genus **ANAPHOIDEA** Girault.

1. **Anaphoidea pullicrura** Girault.

I have captured a female of this species at Litchfield, Ill., July 13, 1910, on stable windows. It may easily be con-

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fused with *Anaphes nigrellus* described in this paper if attention is not given to the structure of the antennal club.

Genus **ANAGRUS** Haliday.

1. **Anagrus armatus** (Ashmead).

Litus armatus Ashmead, 1887, p. 193.

Eustochus xanthothorax Ashmead, ibid., pp. 193–194.

Anagrus columbi Perkins, 1905, p. 198, pls. XII, fig. 4; XIII, fig. 8 a.

Normal position.

Female.—Length, 0.50 mm., average, somewhat variable. Moderate in size for the genus.

General color gamboge but variable somewhat in shadings; bright, uniform. Body shaded with dusky above on thorax and abdomen; sometimes pallid yellow and thus shaded and sometimes with some orange. Legs and antennæ concolorous or the flagellum may be dusky (except proximal funicle joint; that, the scape and pedicel pallid yellow); valves of ovipositor dusky. Ovipositor itself concolorous. Eyes dark reddish. Mouth fuscous. The abdomen may be wholly dusky and with a faint striped appearance due to the pale intersegmental spaces. Wings hyaline, excepting a slight fuscation proximad.

Fore wings as in *Polynema longipes* (Ashmead), that is very narrow and graceful with very long marginal cilia; fore wing curved, clavate, narrow proximad, very gradually, uniformly enlarging distad, then more rapidly enlarging to a pear-shaped apical head, its discal ciliation sparse, only about five or six longitudinal lines just before apex, the central one of which is longer, extending proximad nearly to the base of the marginal vein; the individual cilia are moderate in size, not short nor minute. The apex of the fore wing is bluntly conical. The longest marginal cilia of the fore wing are one and three-quarters longer than the greatest wing width, somewhat unusual for the genus; they are distinctly longer than the longest cilia of the posterior wings. Marginal vein of fore wing moderate in length about six or seven times longer than wide and free and curved distad. Posterior wings very narrow and slender, nearly as long as the fore wings (reaching out to widest point of the fore wing), slightly curved, acuminate, acute at apex, without discal cilia excepting for a paired row along each margin, each line somewhat separated. Hooklets three in number. Marginal cilia of the caudal margin of the posterior wings very long, about three and a half times longer than the wing blade is wide but as stated shorter than the longest cilia of the fore wing.

Parapsidal furrows complete, the mesoscutum subquadrate. Abdomen sessile, short, conic-ovate, the valves of the ovipositor distinctly slightly exserted (not long exserted as stated in the original description of this species, but only exserted to the length of the second funicle

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joint for instance, not more than a fourth or fifth of the length of the abdomen). Tarsi 4-jointed, the joints subequal, the proximal joint in the cephalic legs, however, somewhat longer than the others of the same tarsus. Strigil present on cephalic legs.

Antennæ normal for the genus, 9-jointed. Scape moderate in length, as long as the next three joints combined. Pedicel usual, shorter than second funicle joint, longer than the first. Proximal funicle joint subquadrate, yet somewhat longer than wide, small, only a fourth the length of the second funicle joint and a third that of the pedicel; second funicle joint longest of funicle, slender, a third longer than the pedicel, a fourth longer than funicle joint 3, which is still slender but yet slightly enlarged distad; next three joints subequal in length, broader, cylindrical ovate, each subequal in length to funicle joint 3, each a little stouter than the one preceding but not very stout. Club ovate, solid, slightly longer than the two joints preceding when combined. Pubescence inconspicuous, consisting of sparse, scattered setæ.

From 9 specimens, $\frac{2}{3}$-inch objective, 1-inch optic. Bausch and Lomb.

Male.—The same but somewhat shorter, abdomen shorter than the thorax and bluntly triangular. The antennæ are 13-jointed, filiform, the proximal funicle joint shortest, longer than wide, subequal in length to the pedicel, the other funicle joints about a fourth longer, gradually lengthening somewhat distad and subequal in width; the distal funicle joint is twice the length of the proximal one and about a fourth or more longer than the second funicle joint; club joint conical, slightly shorter than the distal funicle joint.

From 1 specimen, the same objective and optic.

Redescribed at first from one male and nine female specimens captured on windows and by sweeping as follows: One female taken on the window pane of a shed on a farm at Centralia, Illinois, August, 1909; one female (and three of the variety *nigriventris*) taken together on the glass sides of a greenhouse at Urbana, Illinois, April 30, 1910; one male and three females taken together on a greenhouse window, Urbana, May 16, 1910; three females taken by sweeping blue grass and clover at Urbana, June 8, 1910; and a single female captured along the edges of a cypress swamp by sweeping, May 14, 1910 (C. A. Hart and A. A. Girault).

Habitat.—United States: Urbana, Pulaski, Butler, Bloomton and Centralia, Illinois; Jacksonville, Florida; Columbus, Ohio; Annapolis, Maryland.

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Anagrus armatus nigriventris, varietas nova.

Female.—The same as the typical form, differing in having the whole abdomen very dark, nearly black, its tip somewhat lighter and in having the thorax bright yellow; the pronotum is also darker and the head; sometimes just the middle of the thorax remains yellow; the base of the fore wings, across the marginal vein is distinctly fumated; the legs and antennæ remain, however, unaltered.

Male.—Unknown.

This variety, uniquely colored, appears like an entirely different species when viewed casually. Described from ten females captured as follows: Four females captured at Centralia, Illinois, August 25, 1909, on the panes of a window; two others taken from the window of a greenhouse on the campus of the University of Illinois at Urbana, April 30, 1910; and the four remaining specimens captured in the same greenhouse May 2 (one female), October 19 (three females), 1910. With the latter was a single female of the typical form.

Type.—Type No. *13,810*, United States National Museum, Washington, D. C., one female in xylol-balsam (wings missing; the original Ashmedian specimen).

Homotypes.—Accession No. *44,219*, Illinois State Laboratory of Natural History, Urbana, one female in xylol-balsam (Centralia, Illinois, August 29).

Type of the variety *nigriventris:* Accession No. *44,220*, Illinois State Laboratory of Natural History, Urbana, two females in xylol-balsam, 2 slides (Centralia, Illinois, August 25).

While not being able to compare the types of *Anagrus columbi* Perkins, the description of that species leaves little doubt but that it is identical with this species. Therefore, I have given it above as a synonym. As shown elsewhere, *Eustochus xanthothorax* Ashmead is also a synonym of this species. *Anagrus armatus* must be exceedingly common throughout the United States.

I have also the following specimens of the typical form: Centralia, Illinois, on windows, two females (August 27 and 29, 1909); Urbana, in sweepings, one female (May 25, 1910). And of the variety *nigriventris*, six females captured in a

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greenhouse at Urbana, May 23, 1910; one female at Centralia on a window, August 27, 1909, and one male and one female at Butler, Illinois, in a dead artificial cedar forest (sweeping weeds), July 14, 1911; also one male and five females taken in a greenhouse at Annapolis, Maryland, August 25, 1910 (A. A. Girault). Also I have observed females of this species crawling over the panes of a window of a flour mill at Bloomington, Illinois, October, 1909.

2. **Anagrus epos** species nova.

Normal position.

Female.—Length, 0.35 mm. Very small for the genus, not easily visible to the naked eye; about the size of the larger females of *Camptoptera pulla* Girault but less easily seen.

Similar to the typical form of *armatus* Ashmead but slighter and differing in the following structural details: The second and third funicle joints of the antennæ are shorter, the third is somewhat longer than the second, as much longer as the second is longer than the third in *armatus*—thus in this species the second funicle joint is only about two and one-half times longer than wide; whereas in *armatus* it is about five or more times longer than wide; furthermore, while with this species the distal funicle joint is distinctly longer than the second joint of the funicle, in *armatus* it is distinctly shorter; it is broader in both. The fore wings differ—in this species they have finer marginal ciliation somewhat as in *spiritus* and the discal ciliation is somewhat as in *frequens* Perkins, in that a more or less distinct naked area, elliptical in shape, is left near the caudal wing margin just proximad of the apex; only three principal lines of the discal cilia are prominent, the central or third one long, as long as in *armatus;* at the apex, a part (several cilia) of a fourth line is present between the second and third; and a fifth near the caudal margin.

General color gamboge, unmarked, sometimes the base of the abdomen dorsad at base dusky or the whole of the dorsum may be dusky (rarer, the head, pronotum and whole abdomen dusky, the wings then more pronouncedly fumated). Eyes dark red; ocelli ruby red. Legs and antennæ concolorous, only the club of the latter dusky, usually. Fore wings variable, distinctly fumated sometimes across the venation, usually hyaline. Posterior wings without midlongitudinal discal ciliation, as in *armatus*. Ovipositor exserted as in *armatus*. Parapsidal furrows complete.

Antennæ 9-jointed; first funicle joint minute, second about three and one-half times longer, remaining joints lengthening and widening distad.

From 9 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

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Male.—The same as the female but slightly smaller, the abdomen more blunt at apex. Antennæ 13-jointed; first funicle joint globular, slightly smaller than the pedicel; other joints as in *armatus* but decidedly shorter, only a little over twice longer than wide, in *armatns* about thrice so.

From a single specimen, $\frac{2}{3}$-inch objective. 1-inch optic, Bausch and Lomb.

Described from one male and nine female specimens captured: at Centralia, Illinois, on a window, August 25 (one female), September 2 and 4, 1909 (one male, six females); and at Urbana, one female on May 5 and one on October 8, 1910, in a greenhouse.

In the U. S. National Museum collections I have since found two males and one female of this species labelled "471^{xo}. Iss. Sep. 28, '83", but with no other data.

Habitat.—United States: Centralia and Urbana, Illinois.

Type.—Accession No. *44,222*, Illinois State Laboratory of Natural History, Urbana, Illinois, one male, five females in xylol-balsam, 1 slide (Centralia, Sept. 4).

Cotype.—Cat. No. *13,811*, United States National Museum, Washington, D. C., one female in xylol-balsam (Centralia, Illinois, August 25, 1909; mounted with a female of *Camptoptera pulla* Girault).

3. **Anagrus puella** species nova.

Normal position.

Female.—Length, 0.75 mm. Moderately large for the genus and longer than the preceding species (*armatus*, *epos*).

The same as *armatus* Ashmead in general structure but differing at once in having the fore wings distinctly broader, there being about ten longitudinal lines of discal cilia at the widest blade portion (only about five or six in *armatus*). The posterior wings are also broader in proportion. Also larger, longer.

General color gamboge to luteus, wholly suffused with dusky, hence dark; legs and antennæ concolorous, excepting pedicel and first funicle joint which are pallid. Wings hyaline but proximad more or less fumated. Abdomen longer than the head and thorax combined, conicovate, pointed, the valves of the ovipositor exserted as in *armatus*. Fore wings with the discal ciliation arranged in from about nine to eleven longitudinal lines at the greatest wing width, irregular, moderate in density, rather coarse and with the marginal cilia long and moderately fine, the longest about one and a quarter times longer than

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the greatest wing width. Posterior wings with the discal ciliation arranged as with the preceding species, but in the midlongitudinal line at apex there may be a short line of two or three discal cilia. Parapsidal furrows complete. Valves of the ovipositor exserted as in the other species. Also the phragma is present.

Antennæ 9-jointed; the second funicle joint is longest, the proximal joint very short; the distal four funicle joints wider and very gradually shortening.

From 2 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—The same, lighter in color, the abdomen dusky. Scape, pedicel and first funicle joint pale, pallid yellow.

Antennæ 13-jointed, the flagellar joints longitudinally striate, the proximal funicle joint slightly shorter than the pedical or subequal to it, longer than wide, a fourth shorter than the second funicle joint and the club joint. Remaining funicle joints subequal, gradually lengthening distad but the club joint is shorter again and conical, narrower.

From one specimen, the same magnification.

Described from two female specimens captured by sweeping along the edges of a cypress swamp at Pulaski, Illinois, May 14, 1910 (C. A. Hart and A. A. Girault), and a single male specimen received from Prof. T. D. A Cockerell and collected at Boulder, Colorado, August 5, 1910.

Habitat.—United States: Pulaski, Illinois and Boulder, Colorado.

Types.—Accession No. *44,228*, Illinois State Laboratory of Natural History, Urbana, Illinois, one female in xylol-balsam (2 slides as noted above).

4. **Anagrus io** species nova.

Normal position.

Male.—Length, 0.80 mm. Long and slender for the genus, especially slender at the thorax. With the general appearance of *Anaphes gracilis* Howard. Distinguished by its broad fore wings, without discal ciliation on the proximal half of the blade.

General color black, the base of the abdomen pallid yellowish, the scutellum suffused with yellowish but not conspicuously yellow like the base of the abdomen, all of each leg uniformly lemon yellow but the posterior legs are dusky on the femora and tibiæ; whole of the antennæ dusky lemon yellow. Venation dusky yellowish. Wings hyaline but proximad suffused with fuscous out as far as the end of the venation. Distal tarsal joint not darker.

Fore wings broad for the genus, distinctly broader than those of any

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of the preceding species and less paddle-shaped, at their widest point bearing about fourteen longitudinal lines of discal ciliation which has a soft appearance, is moderately fine and not dense nor sparse either; proximad, about half-way from the wing apex to the apex of the venation it abruptly disappears, the surface of the wing then naked with the exception of a single, minute, isolated seta located nearly centrally in the wing opposite the base of the marginal vein. Marginal cilia of the fore wing very fine and long, the longest about one and a quarter times longer than the greatest wing width and slightly longer than the longest marginal cilia of the posterior wings; the latter with the normal discal ciliation, namely only the paired lines along each edge; moderate in width, its longest marginal cilia four or more times longer than the mean width of the blade. Posterior wings reaching nearly to the apex of the fore wings.

Thorax long and slender, nearly twice the length of the small, ovate abdomen; the latter sessile, the genitalia exserted, long and curved, subequal to the abdomen in length. Legs with the proximal tarsal joints moderately long, longer than the other three tarsal joints taken separately, the joints shortening distad; tibial spurs single, usual, the strigil present on the cephalic tibiæ.

Antennæ 13-jointed, filiform, all of the flagellar joints distinctly longitudinally striate, all of the funicle joints spiny or acute at their distolateral angles; scape not long; pedicel short and stout; first funicle joint distinctly longer than the pedicel; second and following joints to tenth, subequal, each very slightly longer than the proximal funicle joint, about three and one-half times longer than wide, slender, cylindrical; the club joint a fifth shorter, obtusely conical. Pubescence not noticeable.

From 1 specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Female.—Unknown.

Described from a single male specimen captured by sweeping miscellaneous vegetation (mostly in meadows) at Urbana, Illinois, May 25, 1910.

Habitat.—United States: Urbana, Illinois; Los Angeles County, California.

Type.—Accession No. *44,243*, Illinois State Laboratory of Natural History, Urbana, Illinois, one male in xylol-balsam (Urbana, Illinois. Mounted with two male Gonatocerus).

I have since found another male of this species mounted on a tag in the National Museum Collection labelled "73^{02}. April 11 '86. Los Angeles Co., Cal". This was remounted

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in xylol-balsam. It differed from the Illinois specimen in having a more or less obscure fuscous cloud crossing the fore wing about midway between the distal end of the marginal vein and the wing apex.

5. **Anagrus saga** species nova.

Normal position.

Female.—Length, 0.55 mm. Moderate in size for the genus.

Difiering at once from all other species of the genus by being wholly black in color, in having the body of the abdomen narrowed at the base as in petiolate genera and having the antennal joints all short, none of them longer than the pedicel. The fore wings though narrow are densely ciliate, the cilia fine.

General color dusky black, the legs and antennæ dusky; portions of coxæ, knees, tips of tibiæ, trochanters and proximal three tarsal joints pallid, the diatal tarsal joint dusky; wings hyaline, venation pallid dusky. Eyes garnet.

Fore wings normal to the genus, their caudal margins straight, the cephalic margins convexly curved, the dilatation near base caudad prominent, the wings somewhat as in *puella* but narrower, distinctly broader than in *armatus* or *epos;* discal and marginal cilia fine, the latter distinctly longer than the greatest wing width, the longest being about a fourth longer; the discal short and fine, distributed uniformly, about twelve longitudinal lines across the widest portion of the blade. Posterior wings narrow, straight, the marginal fringes of the caudal margin five or more times longer than the width of the wing blade, not more than two-thirds the length of the longest marginal cilia of the fore wing, those of the cephalic margin short, just slightly longer than the wing blade is wide. Discal cilia of posterior wings distinct and apparently normal, there being no midlongitudinal line of them, Legs rather less slender than usual, the coxæ all obconic and short, the femora short and obclavate, the posterior tibiæ slenderer and longer than the others, distinctly longer than the caudal femora, the cephalic femora and tibiæ subequal in length, the latter curved, the former obclavate; tibial spurs single, short, small, the cephalic one forming a strigil, curved and forked but yet small; joints of cephalic tarsi short, the proximal joint there thick and short, yet twice the size of either of the following joints; the proximal joint of the caudal tarsi moderately long, slender, a third longer than the corresponding joint of the cephalic tarsi and twice the length of the same joint of the intermediate tarsi. Parapsidal furrows complete, widely separated; abdomen short, ovate, the ovipositor not at all exserted, proximad the abdomen narrowed as if petiolate, about equal to the thorax in length. Vertexal carina present, separating the lateral ocelli from the eye margins.

Antennæ 9-jointed, the joints all short, Scape and pedicel nearly

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equal in size and shape, hence the former shorter than usual; it is, however, somewhat larger than the pedicel, and conic, the pedicel obconic; funicle joints all distinctly shorter and smaller than the pedicel, the first and third joints smallest, subequal, a third longer than wide, distinctly less than a fourth the size of the pedicel; second joint longest, a third longer than joint 1, a fifth longer than joint 6, somewhat over half the length of the pedicel, rectangular-ovate; joints 4, 5 and 6 broader, ovate, 4 distinctly larger than 3, somewhat more so than 5, joint 6 largest of the funicle with the exception of joint 2; it is broader than the latter. The club is short and ellipsoidal, very much larger than any of the funicle joints and distinctly twice the size of either the scape or pedicel, equal to over half the length of the funicle, or of the combined lengths of the scape and pedicel; bearing at least two long longitudinal grooves. Pubescence inconspicuous.

From a single specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from a single female specimen remounted in balsam from a tag in the U. S. National Museum collections labelled "Washington, D. C. 31-7-05. H. S. Barber."

Habitat.—United States: District of Columbia.

Type.—Type No. *13,812*, United States National Museum, Washington D. C., one female in xylol-balsam.

This species resembles a *Polynema* somewhat on account of the narrowing of its abdomen proximad as if petiolate, but I have searched for a petiole in vain. It would be a characteristic species of that genus as it is of *Anagrus* because of its short-jointed antennæ, straight caudal margin of the fore-wing, the narrow fore wings with the long marginal cilia and its general appearance.

DIAGNOSTIC TABLE

of the North American Species of *Anagrus* Haliday—Females, Males.
(Cf. Table for *Anaphes*.)

I. Species yellow or dusky yellow; at least some of the funicle joints longer than the pedicel, the proximal funicle joint minute; fore wings with the discal ciliation reaching to the venation, narrower, bearing from 5 to 11 lines of discal cilia.

1. Fore wings narrow, with only about from 5 to 7 longitudinal lines of discal cilia across the widest blade portion.

a. Second funicle joint of antenna longer and more slender than the third, distinctly longer than the sixth.

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Fore wings usually without a naked area in the blade distad near caudal margin; marginal cilia moderately coarse; bright yellow, varying so that the head, prothorax and abdomen may be black.....**armatus** Ashmead.

Fore wings with a naked area in the blade distad near the caudal margin; marginal cilia very fine; luteous. **spiritus** Girault.

b. Second funicle joint of antenna subequal to or shorter than the third, distinctly shorter than the sixth.

Fore wings with a naked area in the blade distad near the caudal margin; marginal cilia moderately coarse; lemon yellow.....**epos** Girault.

2. Fore wings broader, with about from 9 to 11 longitudinal lines of discal cilia across the broadest blade portion.

a. Fore wings without a naked area in the blade distad near caudal margin; funicle joints very gradually shortening distad.....**puella** Girault.

II. Species black, marked with yellow at base of the abdomen or on thorax; at least some of the funicle joints longer than the pedicel.

1. Fore wings narrow, the discal ciliation normal; thorax yellow; a variant of *armatus*....**armatus nigriventris** Girault.

2. Fore wings broad, the discal ciliation disappearing after the distal half of the wing; base of the abdomen yellow. **io** Girault.

III. Species entirely dusky black; funicle joints of antennæ all shorter and much smaller than the pedicel.

Fore wings moderately broad, with about 12 longitudinal lines of uniform discal cilia across their widest blade portion, their caudal margins about straight.

a. Scape and pedicel subequal; trochanters, proximal tarsal joints and tips of the tibiæ pallid.....**saga** Girault.

Genus **STETHYNIUM** Enock.

1. **Stethynium faunum** species nova.

Normal position.

Female.—Length, 0.55 mm. Moderately small for the genus. Distinguished from all of the preceding species of *Anaphes* and *Anagrus* by the broad fore wings with normal, rather dense discal ciliation, the dilated marginal vein and the peculiar antennal structure, the club 3-jointed.

This genus was just recently described from England (Enock, 1909, pp. 452–453, pl. XII, figs. 1–5), and it is gratifying therefore to find it represented within our fauna. This North American species is gamboge in color, suffused with dusky and it resembles closely the type of the genus, excepting that the fore wings are less rounded at apex the

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outline of the apex being more conical than is the case with the type species. The legs and basal three joints of the antennæ are concolorous, the rest of the antennal joints dusky yellowish. Apparently no circular pits on the scape as described for the type species. Fore wing suffused with dusky proximad. Also the second funicle joint of the antenna is longer and the marginal cilia of the fore wing along the cephalic margin and at apex. The fore wings also appear to be considerably narrower and the body smaller.

Fore wings somewhat similar to those in *Anagrus* but decidedly broader, the excision or dilatation at base along the caudal margin pronounced, nearly a lobe, the discal ciliation uniform, moderately fine and dense, arranged in about fifteen to seventeen longitudinal lines across the widest portion of the blade; marginal vein somewhat dilated distad, moderate in length; marginal ciliation at the apex shorter than that along the cephalic wing margin, but around the apex to the caudal margin, lengthening, becoming very long a fourth of the distance toward the dilatation, the longest there being nearly seven-eighths the greatest wing width (they are at the greatest wing width). The longest marginal cilia of the posterior wings are three and a half times longer than the mean width of the blade of these wings, long and slender, but distinctly shorter than the longest cilia of the fore wing. Marginal cilia of fore wing along caudal margin sloping away in each direction from the longest, in other words gradated.

Tarsal joints short, tibial spurs single, short, straight; valves of the ovipositor exserted as in *Anagrus armatus* (Ashmead). Antennæ 11-jointed, the club 3-jointed; as in the type species but the proximal funicle joint is stouter and slightly shorter than the third funicle joint, the second funicle joint is distinctly the longest joint of the funicle, slender; joints 4, 5 and 6 stouter, subequal to 3 in length, which, however, is slenderer. The club has a lamellate appearance due to the curved articulations between the three segments. Strigil present, the cephalic tibial spurs curved.

From 1 specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—See beyond.

Described from a single female captured on the window of a railway station at Hendrix (Bloomington), Illinois, June 14, 1910.

Habitat.—United States: Bloomington and Urbana, Illinois.

Type.—Accession No. *44,244*, Illinois State Laboratory of Natural history, Urbana, Illinois, one female in xylol-balsam.

Subsequently, I have obtained another species of this

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genus from West Australia which is new and will be described elsewhere. Also, later I found a single male specimen of *faunum* in my personal collection mounted with miscellaneous mymarids (*Polynema howardii ; Gonatoceous brunneus* and so forth) captured by sweeping low vegetation at Urbana, Illinois, May 25, 1910. The antennæ are filiform and 13-jointed, the flagellar points longitudinally striated, the joints subequal and gradually lengthening distad, excepting the proximal joint which is shorter nearly by a half than the second funicle joint, longer than wide, slightly longer than the pedicel which is globular. The twelfth and thirteenth joints forming a rather long club, the distal joint shorter. The funicle joints are acute at their disto-lateral margins. Otherwise as in the female, excepting that the abdomen is shorter and more blunt.

Tribe **Mymarini.**

Genus **EUSTOCHUS** Haliday.

1. **Eustochus xanthothorax** Ashmead.
   Ashmead, 1887, pp. 193–194.

As stated above this is *Anagrus armatus* (Ashmead). The original specimen was in bad condition, a soiled female specimen, the body evidently wholly yellow, not as described ; the tarsi 4-jointed, the abdomen sessile, not petiolate, hence it can not be an *Eustochus ;* the original specimen was labelled in the handwriting of Ashmead, "*Eustochus xanthothorax* Ashm. Type." and "Jacksonville, Fla." on a printed label. No number was in connection with it. It agrees perfectly with *Anagrus armatus* Ashmead. No species of this genus have been found to occur in North America up to the present time.

Genus **POLYNEMA** Haliday.

1. **Polynema howardii** (Ashmead),
   Cosmocoma elegans Howard, 1881, p. 371, pl. xxiv, fig. 7.
   Cosmocoma howardii Ashmead, 1887, p. 194.
   Idem, de Dalla Torre, 1890, p. 97.

This species was lost and nearly unrecognizable from its description and its identity in collections has been considerably mixed. It will be a difficult species to recognize with-

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out comparing it with actual specimens of the allied species. Recently, I have found the original specimens and am able to fix the species as definitely as possible. It is apparently rare for I have not found it in Illinois nor in the miscellaneous specimens in the U. S. National Museum collections. In the U. S. National Museum collections, however, I have found the following type specimens from which the following notes were made. One tagmounted male type specimen labelled "*Cosmocoma elegans* Howard MS. (T) Type No. 2621, U. S. N. M. No. 722^{C}. Proctotrypid or 3-spotted Kermes. Iss. Oct. 16, '80." Of this specimen, only the abdomen, a leg and a pair of wings remain. A fore wing and a posterior wing were removed and mounted in balsam (= Hym. slide 116, U. S. National Museum) and these notes made: Fore wings with the longest marginal cilia three-fourths as long as the greatest wing width, and with the discal cilia in about eighteen longitudinal lines across the greatest wing width, each cilium long or moderately long, the blade uniformly ciliate; wing hyaline; marginal cilia long. Posterior wing maculate with dusky, linear but not very narrow, the discal ciliation confined to the cilia along the edge, the line along the cephalic edge becoming paired distad, that of the caudal margin single. Tarsi 4-jointed, the proximal joint nearly as long as the other three united. Abdomen shining.

And a second tagmounted type male specimen labelled "*Cosmocoma* Howardii Ashm. ♂. Cosmocoma elegans Howard MS. (T). Type No. 2621, U. S. N. M. No. 722^{C}. Proctotrypid or 3-spotted Kermes. Iss. Oct. 16, '80." The following notes: Body smooth, shining, without apparent sculpture, except on mesoscutum where there are fine lines and figures. Scutellum with a line of minute punctures across its distal two-thirds. Antennæ with the proximal and ninth funicle joints subequal, shortest, somewhat longer than the short scape; funicle joints 2 to 8 subequal, longest, cylindrical oval, a third longer than the proximal joint; joints 10 and 11 (club) subequal, more slender, a fourth shorter than joint 2 of the funicle. Pedicel globular but longer than

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wide, only half as long as the proximal funicle joint. Parapsidal furrows complete.

From this second specimen an antenna was removed and mounted in balsam, so as to aid in comparing the relative size and shape of the joints (= Hym. slide 119, U. S. National Museum). The foregoing two specimens are undoubtedly the original specimens of the species and the types.

This species is closely allied with the following species: *striaticorne* Girault, *enchenopæ* Girault and *consobrinus* Girault. I have mistaken it for all three, yet there are differences which I may be able to make clear, especially in the table of species given beyond. From *striaticorne* it differs in having less graceful, somewhat broader fore wings (what is said concerning this in Girault. 1911 a, is erroneous, wrongly determined specimens of *howardii* there used for comparison) with the discal ciliation fine yet each cilium longer than in *striaticorne* and with the marginal cilia distinctly longer; the fore wing instead of being long-elliptical is more ovate, broadening more distad. From the species *enchenopæ* differing at once by having the discal ciliation of the fore wing finer and the fore wing itself broader and the marginal cilia longer. From *consobrinus* it may be distinguished by its still much broader fore wings. Its position in the table of species will perhaps aid in identifying it better.

The species is recorded by Nason (1906, p. 8) in his Algonquin (Illinois,) list, but an examination of the single female specimen shows that it is *Polynema sibylla* Girault, and not *howardii*. Also Smith (1899, 1910) records it from New Jersey; it is quite possible that it occurs there but as yet has not been found in the eastern United States.

2. **Polynema striaticorne** Girault.

Since fully describing this species (Girault, 1911 a) I have seen and studied the following specimens besides the types: From the U. S. National Museum collection, remounted in balsam from tags — a single female labelled "Roslyn, Va., June 22"; a single female labelled "Ind. 700"; a female placed with a female of *bimaculatipenne* and a male of *graculus*, all labelled "Cosmocoma ♂ ♀. From wheat,

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February, 1891. College Station, Texas. Webster"; a female specimen labelled simply "197"; two male specimens labelled "Cosmocoma howardii Ashm. ♂. 196"; seven females mounted on the same tag labelled "659 P. Uriah McCall"; and another female labelled "J. B. Norton, Riley Co., Ks. 4 Oct." also two females labelled "Colo. Baker. 855, 867"; and a female labelled simply "Washington, D. C." From the Nason Collection (Illinois State Laboratory of Natural History)—Three females labelled "*Cosmocoma maculipes* Ashm. ♀. Algonquin, Illinois, 5, 10, 96–151, 6810. 6786. 6788." From my personal collection—one female collected by sweeping, Urbana, Illinois, May 25, 1910; a male captured the following day in the same manner and place; two females captured on stable windows with *Gonatocerus anthonomi* Girault at Butler, Illinois, July 15, 1910; at Urbana, Illinois, on greenhouse windows, a female on April 30 and two males on May 24, 1910, and one female on July 27; two females with a female of (*Stephanodes*) *Polynema psecas* on a stable window at Mattoon, Illinois, July 16, 1910; and by sweeping grass in an orchard at Du Bois, Illinois, June 23. 1910, a single male. The species therefore is distributed as follows in the United States: New York (Albany, Geneva); Missouri (various localities); Illinois (Urbana, Algonquin, Butler, Mattoon and Du Bois); District of Columbia; Virginia (Roslyn); Indiana; Texas (College Station); Kansas (Riley County); and Colorado.

Variation occurs in *striaticorne* but not to any extent; the third funicle joint may be relatively shorter in some specimens in relation to the second, somewhat as is normal in *enchenopæ* for instance; the proximal tarsal joints of the caudal legs may be shorter in some specimens; in the males, the scape may vary to yellowish and even the first funicle joint, occasionally, may vary to the same color; also in an occasional specimen, the antennal joints will appear to be shorter than typical. In both sexes the dusky black of the legs will vary in intensity and also in individuals of both sexes, at certain aspects, the peculiar sculpture of the "genus" *Stephanodes* Enock is observable on the scape but

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not as strongly as in *P. enockii* Girault, for instance; nevertheless, at times a row of minute teeth is visible along the under side of the scape and a peculiar sculpture like that described for *P. psecas;* in most specimens however, these are not to be seen. The species is intense black of body, brownish-black with transmitted light.

3. **Polynema bimaculatipenne** species nova.

Normal position.

Female.—Length, 1.10 mm. Moderate in size for the genus. Characterized by being black and having in the fore wings a slight fuscous round spot at the apex and a band of the same crossing the wing at about its middle,

General color black, the legs and antennæ concolorous, suffused with some brownish, only the proximal three tarsal joints, the distal ends of the tibiæ, the knees, the posterior trochanters and the abdominal petiole being pallid and tinged with slight yellowish. Venation dusky. Wings hyaline but a broad slight fumated band crosses the fore wing at its middle (less distinct at the immediate cephalic margin, somewhat more distinct at its middle) and distad nearly at the apical edge is a roundish fumated spot, moderately large.

Fore wings large, broad but not very much so, its discal ciliation fine and uniform, disappearing at the proximal edge of the fumated band (distad about the length of the antennal club from the venation) and arranged in about from twenty-six to thirty longitudinal lines at the greatest wing width; the marginal cilia of the cephalic margin short and fine but much longer than the discal cilia, that of the posterior margin much longer, yet but moderately long, thus being only about a fourth as long as the greatest wing width and but slightly longer than the longest marginal cilia of the posterior wing. Posterior wings broad, its margins parallel but distad ending in an obtuse point, bearing two distinct lines of discal cilia along each edge and a third line is indicated distad (four or five cilia) near the inner line along the cephalic edge; these lines abruptly disappear halfway proximad to the venation. The longest marginal cilia of the posterior wing about one and a half times longer than the width of the blade, the latter not noticeably broadened across the apex of the venation. Marginal cilia of the cephalic margin of the posterior wings short, shorter than the corresponding ones of the fore wing, about half as long as the blade of the posterior wing.

Abdomen ovate, somewhat shorter than thorax (excluding petiole), only the tip of the ovipositor exserted. Petiole cylindrical, stout long, three-fourths the length of the proximal tarsal joint of the caudal legs; metathorax with a narrow acute median carina. Parapsidal furrows complete. Tibial spurs short, single, those of the cephalic legs form-

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ing a strigil and curved. All coxæ short and obconic. Proximal tarsal joints long and slender, especially those of the caudal legs which are slightly longer or subequal in length to the combined length of the other joints, distinctly twice longer than the second joint.

Antennæ normal to the genus. Scape moderate in length, not long, about as long as the pedicel and first funicle joint combined; pedicel obconic, slightly longer than the first funicle joint, which is four times longer than wide, somewhat over a half longer than the second funicle joint; the latter long and slender, a third longer than joint 3 which is slightly longer than 1; of the next three funicle joints, the second (joint 5) is shortest, not much longer than wide, rectangular, the first (joint 4) a fourth longer than the middle joint and the third (distal funicle joint) is nearly a third longer than the first (joint 4) or subequal in length to the proximal funicle joint but broader, cylindrical ovate; joint 3 of funicle slightly widening distad; joints 4, 5 and 6 each slightly wider in succession; club solid, long, conic-ovate, with longitudinal grooves leading from apex. Pubescence sparse, short, inconspicuous. The club is longer than the scape.

From a single specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from a single female specimen remounted in balsam from a tag in the National Museum collections labelled "Cosmocoma. From wheat. College Station, Texas, Feby., 1891. Webster".

Habitat.—United States: College Station, Texas.

Type.—Type No. *13,813*, United States National Museum, Washington, D. C., one female in xylol-balsam.

4. **Polynema caesariatipenne** species nova.

Normal position.

Female.—Length, 0.95 mm. Moderately small for the genus.

Allied with and resembling *maculipes* Ashmead but at once distinguished by its peculiar fore wings, which are more petiolate, the blade more paddle-shaped, its sides parallel, broader, its marginal cilia longer and finer, distinctly longer, but not very much so, than the blade's greatest width, the blade regularly elliptical-ovate, the discal cilia remarkable in being very long like hair, as long, or somewhat longer, for instance, than the long marginal cilia of the caudal margin of the posterior wings, but by far not as long as the marginal cilia of the fore wing; moreover it is somewhat curly and projects into the field of the marginal cilia. The coloration is the same as in *maculipes* but the yellow parts of the body are a less intense yellow, pallid to neutral yellow. The marginal cilia of the cephalic margin of the poste-

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rior wings is twice longer in this species than with *maculipes* and also the few discal cilia of the same wing are decidedly longer than in that species. Also the fore wing is uniformly fumated.

Fore wings with the long, hair-like discal cilia arranged in about fifteen longitudinal lines across the widest blade portion of the wing, the marginal cilia very fine, slender and long, about one and a fifth times longer than the greatest width of the wing, the latter about twice the width of tne blade of the wing of *longipes*. Proximal tarsal joints slightly shorter than the combined lengths of the other three, long.

Antennæ 9-jointed, normal. Scape long and slender, as long as the pedicel and first two funicle joints combined; proximal funicle joint very small, only a half the length of the pedicel and very much narrower, longer than wide; second funicle joint longest of the funicle, long and slender but not very long, widening somewhat distad, about a third longer than the next joint which is over twice the length of the first joint; joint 4 subequal in length to 1 but wider; joints 5 and 6 subequal, ovate, each somewhat longer than 4 but distinctly shorter than 3. Club very much the largest joint but slightly shorter than the scape. Pubescence soft and close, not conspicuous.

From a single specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from a single female specimen remounted from a tag in the collection of the United States National Museum and labelled "Washington, D. C., July 30. Fredk. Knab, collector."

Habitat.—United States: District of Columbia.

Type.—Type No. *13,814*, United States National Museum, Washington, D. C., one female in xylol-balsam.

This species is more closely allied with *zetes*, but in the latter the contrasting yellow thorax, the narrower fore wings with the discal cilia somewhat shorter and the shorter second funicle joint of the antennæ are characters which readily distinguish the two.

5. **Polynema maculipes** (Ashmead).

Cosmocoma maculipes Ashmead, 1887, p. 194.

Polynema maculipes (Ashmead) Girault, 1911 a, p. 22.

The original specimen—not the type—of this species was found in the collections of the United States National Museum mounted on a tag; it was labelled "Cosmocoma maculipes Ashm. Type. Jacksonville, Fla." and had no number

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in connection with it. Being remounted in balsam, I now redescribe it and deposit the specimen as type in the collection from which it was obtained.

The species belongs in that group of the genus having narrow fore wings and coarse discal ciliation and thus is allied with *longipes* and *zetes* from both of which it may be distinguished by its broader, less slender fore wings, the longest marginal cilia of which are barely longer than the wing is wide. Compared with *longipes* its fore wings are broad, but compared with the species like *striaticorne* and *howardii*, they are narrow. The wings are also somewhat as in *enchenopæ* as concerns discal ciliation and general appearance but are noticeably narrower and the ciliation is more coarse.

Male.—Length, 0.90 mm. Moderately small for the genus.

General color black, the legs, abdominal petiole, scape and pedicel yellow (subtestaceous), the wings hyaline; distal tarsal joints and venation brown-black.

Fore wings moderately narrow, with long marginal cilia, the longest about equal in length to the greatest wing width, the discal ciliation coarse and moderately long, arranged in about ten longitudinal lines across the widest portion of the wing blade, the latter shaped like a paddle. Posteror wings linear, the marginal fringes along the caudal margin long, distinctly shorter than the longest cilia of the fore wing but four or five times longer than the width of the blade of the posterior wings. The latter without discal ciliation other than the paired lines along each margin. Proximal tarsal joints long, subequal in length to the combined lengths of the second and third joints.

Antennæ missing, excepting the first six joints of one. Normal for the male. Scape short but longer than the short, obconic pedicel; funicle joints filiform, distinctly striated longitudinally, the proximal funicle joint a fourth longer than the pedicel, the next three subequal, a fourth longer than the first funicle joint.

From 1 specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Female.—Unknown.

Redescribed from the single original male specimen, remounted in balsam.

Habitat.—United States: Jacksonville, Florida.

Type.—Type No. *13,815*, United States National Museum, Washington, D. C., one male in xylol-balsam.

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This species has been recorded from Illinois by Nason (1906, p. 8) but the six specimens found in the Nason collection (Illinois State Laboratory of Natural History) are not referable here but represent several species (*striaticorne*, *consobinus*).

6. **Polynema graculus** species nova.

Normal position.

Male.—Length, 1.10 mm. Moderately large for the genus.

A species characterized by having the broadest fore wings yet observed in a species of the genus; the fore wings are shorter and more rounded, less graceful and nearly as in the broad-winged species of *Gonatocerus* (e. g. *dolichocerus*).

General color jet black, only the knees, tips of tibiæ and proximal two tarsal joints being pallid, the trochanters and abdominal petiole brownish; wings hyaline excepting proximad, caudad of the venation, where there is slight fumation. Venation black.

Fore wings less slender than usual, shorter and broader, less graceful than usual, the discal ciliation arranged in about thirty-five longitudinal lines of cilia at the widest blade portion, moderately dense, fine; the marginal cilia only moderate in length, the longest only somewhat over a fourth the length of the greatest wing width; venation usual. Posterior wing moderately broad, subacuminate but only obtusely pointed at tip, the discal cilia absent proximad (nearly the proximal half), distinct, consisting of the usual paired lines along each margin (which here are somewhat away from the margins) and in the midlongitudinal line of the blade, distal half, several irregularly placed cilia, some paired; longest marginal cilia (caudal margin) not quite twice the length of the blade's greatest width, becoming paler and shorter proximad. Abdomen much shorter than the thorax. Legs slender, the proximal tarsal joints of the caudal legs long and slender, equal to the combined length of the distal three; strigils present. Tibial spurs single, moderately short but rather strong.

Antennæ usual for this sex, 13-jointed, the flagellar joints all longitudinally striate, rather finely so; scape short but about twice the size of the pedicel; the latter with one lateral margin incised, the other convex, short; first funicle joint about thrice the length of the pedicel and about a fourth or fifth shorter than the following joint; remaining joints subequal, the club joint shortest of the flagellum, ovate, very slightly shorter than the proximal funicle joint.

From 1 specimen, ⅔-inch objective, 1-inch optic, Bausch and Lomb.

Female.—Unknown.

Described from a single male specimen from the collec-

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tions of the Milwaukee Public Museum, Milwaukee, Wisconsin, remounted from a tag and which bore the following labels, "Milw. Co., Wis. VI. 1. 1906. 37,016." Collected by Mr. C. T. Brues.

Habitat.—United States: Milwaukee County, Wisconsin; College Station, Texas.

Type.—Type No. *13,816*, United States National Museum, Washington, D. C., one male in xylol-balsam (mounted with *Gonatocerus fasciatus* Girault and an *Anaphes*).

Later, another male specimen of this species was found mounted with the species *bimaculatipenne* and *striaticorne* and labelled "From wheat. Febry. 1891, College Station, Texas. Webster." From the United States National Museum collection.

7. **Polynema consobrinus** species nova.

Normal position.

Female.—Length, 0.75 mm. Moderate in size for the genus.

A species related to *enchenopæ* Girault and easily confused with it but differing as follows: Primarialy in having finer discal ciliation in the fore wing; in this species the discal cilia are arranged in about fifteen lines across the widest blade portion, in *enchenopæ* in only about twelve lines; but this difference does not distinguish the two enough—the quality of the discal ciliation is different; thus in *enchenopæ* the individual cilia are twice if not thrice the size of those in this species. Differing also in having the fourth and fifth funicle joints of the antennæ subequal, whereas in *enchenopæ*, the fourth is smaller than the fifth. The proximal tarsal joints of the caudal legs are also relatively shorter in this species. Otherwise, the two species are indistinguishable. The line of foveæ across the apex of the scutellum is present.

From 17 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown. (See beyond.)

Described from the following series of specimens: (1) From the United States National Museum collections, remounted from tags—a single female labelled "From Webster. Unique. 16^{24}". Also one female labelled "Ohio. 1705". (2) From the Nason collection (Illinois State Laboratory of Natural History, Urbana) remounted in balsam from tags — three females labelled "*Cosmocoma maculipes*

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Ashm. Algonquin, Ill., 5–10, 12, 13, '96—151" and "6807", "6787" and "6785" respectively. (3) By collecting myself in Illinois—at Urbana, on greenhouse windows, seven females (April 30, 1910), one female (June 8, 1910); at Urbana by sweeping, one female (May 26, 1910); at Pulaski along the edges of a cypress swamp, May 14, 1910, one female (C. A. Hart and A. A. G.); and at Centralia on windows one female (August, 1909). Also a single female reared from the eggs of *Enchenopa binotata* (Say), Chicago, Illinois, together with the species *enchenopæ* and mounted with the cotypes of that species.*

Habitat.—United States: Ohio; Illinois. (Chicago, Urbana, Pekin, Centralia, Algonquin, Normal and Pulaski); Michigan (Agricultural College).

Type.—Type No. *13,817*, United States National Museum, Washington, D. C., one male in xylol-balsam (Pulaski, Ill., May 14, 1910).

Cotype.—Accession No. *44,245*, Illinois State Laboratory of Natural History, Urbana, four females in xylol-balsam, 1 slide (Urbana, Ill., April 30, 1910).

This species may be confused with *howardii* but is smaller and resembles it in the wing ciliation only. It is common in Illinois.

Subsequently, I have found the following specimens: A single female in the collections of the U. S. National Museum labelled "Ag. Coll., Mich. 356. Baker". Two females captured at Urbana, Illinois, by sweeping blue-grass and clover, June 8, 1910 (A. A. G.). And from the Nason collection, placed with a single female of *striaticorne*, three females bearing the label "*Cosmocoma maculipes* Ashm. ♂. Algonquin, Ill. 5–10, 96—151", and "6810", "6796" and "6788" respectively. From the collections of the Illinois State Laboratory of Natural History: Four females (Accession No. *16,270*) captured with a female of *longipes* at Urbana, Ill., by sweeping wheat, May 7, 1891 (Marten); one

* This specimen differed from the others of *consobrinus* in having the third funicle joint longer, but slightly shorter than the second; but I do not think it can be another species.

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male* (Accession No. *3816*) by sweeping in woods, Pekin, Ill., August 14, 1883 (S. A. Forbes); another single male (Accession No. *3391*) collected at Normal, Ill., June 15, 1883 (Forbes).

As the fore wings of this species vary somewhat in width, so that occasionally the largest marginal cilia exceed slightly the greatest wing width, *longipes* may become confused with it.

8, **Polynema sibylla** species nova.

Normal position.

Female.—Length, 1.50 mm. A large robust species with broad fore wings.

This species is undoubtedly allied with *needhami* Ashmead, agreeing with the general original description of that species, but very distinctly disagreeing from the statement made in the original description of *needhami* that the ovipositor is exserted for two-thirds the length of the abdomen. In this species it is exserted only for about a fourth of the length of the body of the abdomen and thus is not exserted to any great extent, not considerably as is the case with *needhami*. This species resembles very closely (*Stephanodes*) *Polynema enockii* (Girault) but may be distinguished at once by its shorter proximal funicle joint of the antenna, which is typical for the genus, distinctly much shorter than the typical long second funicle joint.

General color deep black, the legs, abdominal petiole, scape, pedicel and proximal funicle joint intense chrome orange, the named antennal joints pale yellow; also of the legs, the cephalic and intermediate tibiæ are fuscous, or nearly, the distal tarsal joints black. Venation brown-black like the six distal antennal joints. Wings perfectly hyaline. Exerted valves of ovipositor black.

Fore wings broad, broader than in *howardii*, broad and long yet graceful as in *Polynema enockii* (Girault), the discal cilia moderately fine, arranged in about from twenty-seven to thirty longitudinal lines at the broadest blade portion, the marginal cilia but moderate in length, the longest not quite half as long as the grearest width of the wing, somewhat longer than the longest marginal cilia of the posterior wing. The latter is long and slender, with the usual discal ciliation.

Proximal tarsal joints long and slender, especially those of the posterior legs which are subequal in length to the distal three joints, the second joint in the posterior legs long also, but not quite a half the

* The males differ only in the secondary character. Their funicle joints are long and slender, longitudinally striate, about six times longer than wide, the distal and proximal flagellar joints subequal, a fourth shorter.

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length of the first. Strigils present. Valves of ovipositor exserted but not very much, only for about a fourth of the length of the abdomen.

Antennæ normal; scape broad, somewhat longer than the pedicel and first funicle joint united; pedicel subequal in length to the proximal funicle joint which is slender but somewhat less than a half of the length of the long second joint; the latter longer than the scape and about a fourth longer than the third funicle joint which is long, two-thirds longer than the proximal and fourth funicle joints taken separately; joint 4 wider; joint 5 slightly wider and longer than 4; the sixth or distal funicle joint still somewhat longer and wider, distinctly shorter than funicle joint 3, cylindrical-ovate. Club long-ovate, normal. Scape without peculiar sculpture; pubescence not conspicuous.

From a single specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Length, 1.43 mm. The same, but the legs and abdominal petiole are dusky, the scape and pedicel pallid yellowish, the knees, trochanters and proximal three tarsal joints pallid yellowish.

The joints of the flagellum are very long and longitudinally striate, the distal or club joint about a third shorter, the proximal funicle joint slightly shorter than the next joint, the latter and those remaining subequal in length, about four times the length of the pedicel.

From 2 specimens, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Described from the following specimens, mounted in xylol-balsam: A male specimen mounted on a tag in the U. S. National Museum collections labelled in Ashmead's hand "*Cosmocoma flavipetiolata* Ashm. Type. Arlington, Va."; another male in the same collection but without labels; and a tag-mounted female specimen in the collection of the Milwaukee Public Museum, Milwaukee, Wisconsin, labelled "*Polynema needhami* Ashmead. ♀. Milw. Co., Wis. VI, 1, 1906. 37,017".

While this species so closely resembles *needhami*, as known through the latter's general description, yet it can not be reconciled with the description of that species on account of the statement therein that the ovipositor is exserted for two-thirds the length of the abdomen: in this genus, the fact that it resembles *needhami* in color is nearly meaningless, for other distinct species so resemble each other. The ovipositor in *sibylla* is not exserted for any length.

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Habitat.—United States: Wisconsin (Milwaukee); Virginia (Arlington); Illinois (Algonquin).

Type.—Type No. *13,818*, United States National Museum, Washington, D. C., one female in xylol-balsam, 1 slide (Milwaukee, Wis.).

Cotype.—Accession No. *44,246*, Illinois State Laboratory of Natural History, Urbana, Illinois, one female in balsam (Algonquin, Ill.).

Subsequently I have found another female of this species remounted in xylol-balsam from a tag in the Nason collection and labelled in Ashmead's handwriting "*Cosmocoma howardii* Ashm. Algonquin, Ill. 5. 10. 96—151. 6809." This is designated as the cotype (head missing); see Nason (1906, p. 8).

9. **Polynema piceipes** Girault.

Polynema picipes Girault, 1905, pp. 91–92.
Polynema piceipes Girault, 1911 a, p. 22.

From the single type specimen of this species I have taken the following notes: Second funicle joint of antenna longest, slender, nearly thrice the length of the first joint and a third longer than the third funicle joint: fourth funicle joint subequal to the first; fifth and sixth subequal, oval, shortest, a third shorter than the first; funicle gradually enlarging beyond the second joint; club of antenna large, egg-shaped, distinctly longer than the united lengths of joints 2 and 3 of the funicle; funicle joint 3 long-ovate, 4 cylindrical oval; pedicel slightly longer than the proximal funicle joint. Fore wings narrow, moderately, densely, uniformly ciliate, the longest marginal cilia about a third as long as the greatest wing width, hyaline. Fore wings with the discal cilia arranged in about from ten to twelve to fifteen longitudinal lines at the widest blade portion, each cilium moderately long but the lines not separable. Ovipositor not at all exserted. Body shining, no conspicuous sculpture. Fore wing with a clear naked band across it just beyond the apex of the venation, the discal ciliation disappearing abruptly proximad some distance distal of the venation; in this type specimen,

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this clear naked band was followed by a lightly fumated band across the proximal boundary of the discal ciliation.

The specimen is a female mounted on a tag in the U. S. National Museum collection labelled "*Polynema picipes* Girault ♀. Type No. 8943, U. S. N. M. J. H. Beattie, Collector. Ft. Valley, Ga. VI, 20." The antennæ and a fore wing have been remounted in balsam on a single slide, labelled "Hym. Slide 115", United States National Museum.

In the collections of the United States National Museum I have found a single specimen of this species, tagmounted, now remounted in xylol-balsam which bore this label—"Oswego, N. Y. August 4, 1896". This specimen has been compared with the type and hence is now designated a homotype. The species thus occurs in Georgia and New York. The narrow fore wings having fine discal ciliation and only moderately long marginal ciliation (not by far longer than the greatest wing width) and the shortened distal three funicle joints, the comparatively very long second funicle joint are characteristics which make the identification of this species easy.

Homotype,—Accession No. *44,247*, Illinois State Laboratory of Natural History, Urbana, one female in xylol-balsam (Oswego, N. Y.).

10. **Polynema zetes** species nova.

Normal position.

Female.—Length, 0.80 mm. Small for the genus.

Similar to *longipes* but differing as follows: The whole of the thorax is pale cadmium yellow; the fore wings are less petiolate and broader, their discal cilia decidedly longer and the antennal joints differ in that the second funicle joint is shorter, not distinctly twice longer than the third joint; also the proximal funicle joint is much shorter than in *longipes*; the second funicle joint in *longipes* is distinctly longer than the pedicel, barely longer in this species.

General color black; general appearance that of *longipes* but the body is more slender, the fore wings less graceful and more densely ciliate discally. Thorax pale cadmium yellow; legs, antennal scape and pedicel and abdominal petiole lemon-yellow, the proximal funicle joint somewhat darker. Wings slightly, uniformly fumated. Venation, distal tarsal joints, distal five funicle joints and the club black or nearly, but the whole funicle is more of less suffused with yellow.

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Fore wings shaped as in *longipes* but the blade is less petiolate, widening farther proximad and broader, the discal ciliation distinctly coarser and long, at the widest blade portion arranged in about twelve longitudinal lines, the marginal diliation as in *longipes* but coarser and not quite so long in relation to the greatest wing width, though distinctly longer than the greatest wing width. Posterior wings as in *longipes* but shorter; very narrow and straight. Legs as in *longipes;* also other body characters. Ovipositor not exserted. Vertexal carina present.

Antennæ 9-jointed. Scape as long as the pedicel and first two funicle joints combined; pedicel globular-obconic, longer than the proximal funicle joint, slightly shorter than the second funicle joint; the latter longest of the funicle joints, only moderately long, widening slightly distad, over twice the length of the short proximal funicle joint which is not much longer than wide. The third joint is about a third shorter than the second. Joints 4 and 5 shorter and broader, subequal, but 5 slightly shorter, about a third shorter than 3; joint 6 of the funicle somewhat longer than either of the two preceding joints but not as long as joint 3, broader than joints 4 or 5. Club abruptly very large, ovate, as long as the combined lengths of joints 2, 3 and 4 of the funicle. Pubescence sparse; the club minutely hispid.

From 1 specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.

Male.—Unknown.

Described from a single female specimen taken on greenhouse windows at Urbana, Illinois, July 27, 1910.

Habitat.—United States: Urbana, Illinois.

Type.—Accession No. *44,248*, Illinois State Laboratory of Natural History, Urbana, Illinois, one female in xylol-balsam. *Cotypes.*—Cat. No. *13,819*, United States National Museum, Washington, D. C. (two females in xylol-balsam, 1 slide; with a specimen of *P. longipes* and a *Gonatocerus*).

This species more closely resembles *caesariatipenne* because of the somewat long, somewhat hair-like discal cilia of the fore wings, but otherwise they are distinct and may be distinguished by aid of the table of species given beyond. In this species, however, the discal cilia are more like those of *maculipes*, those of *longipes* being the nearest to normal ciliation, nearly normal in fact. The species *caesariatipenne* has this ciliation unusually long, like hairs.

I have since seen two other females of this species mounted

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in balsam and captured together with a female of *longipes* on a window of a greenhouse at Urbana, Illinois, July 27, 1910, or at the same time the original specimen was captured.

11. **Polynema longipes** (Ashmead).
Ooctonus longipes Ashmead, 1887, p. 192.
Polynema citripes Ashmead *nomen nudum* of authors. (See Girault, 1911 a, pp. 19–22).

An examination of the type or rather original specimen of *Ooctonus longipes* Ashmead shows that it is a typical Polynema. It is the same species designated in the literature as *Polynema citripes* Ashmead, and which was about to be described under that name. The name of course will have to be changed to *Polynema longipes* (Ashmead). The original specimen was found on a tag in the collections of the United States National Museum labelled *Ooctonus longipes* Ashmead in Ashmead's handwriting and "Jacksonville, Fla." It also bore a yellow label upon which was written "Type" but no number was in connection with it. It has been remounted in xylol-balsam and designated as the type. It is a female. The species is widely distributed in the United States. No species of *Ooctonus* have been described from the United States, though there is an *Ooctonus homolodiscæ*, a *nomen nudum* extant in the literature, indicating that the genus is found here.* The species in general appearance resembles a narrow-winged "*Stephanodes*" (=*Polynema*) and varies considerably in color, the yellow parts varying from pale lemon-yellow to intense chrome orange. The width of the fore wings also varies somewhat.

I have since captured, or have obtained, the following specimens in Illinois and elsewhere: Mattoon, Ill., stable windows (July 16, 1910, one female); one female in the National Museum collections bearing the labels: "Cosmocoma ♀. *Litus tenuipennis*. From Fitch's collection. 11,901". Another female in the same collection, without labels. A slide in the collection of the National Bureau of Entomology bearing two females and labelled "From C. W. Mally, Wooster, Ohio. Dec. 17, '97. In breeding-cage containing wheat."

* The *Ooctonus* mentioned by Girault (1905, p. 92) is a proctotrypid.

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Also these: One female specimen captured with two females of the species *zetes* at Urbana, Ill., July 27, 1910, on greenhouse windows; a female captured on the pane of a small window in a shed on a farm at Centralia. Ill., August 27, 1909, in company with *Camptoptera pulla* Girault and *Anagrus armatus nigriventris* Girault; a female captured at Urbana, Ill., April 30, 1910, with *Anagrus armatus* Ashmead, and another captured at Centralia, Ill., September 2, 1909, with *Anagrus epos* Girault. Finally, a single female captured with four females of *consobrinus* by sweeping wheat, Urbana, Illinois, May 7, 1891, Marten (Accession No. *16,270*, I. S. L. N. H.).

The species is widely distributed in the United States and common. For other information concerning it, see Girault (1911).

Type.—Type No. ——, United States National Museum, Washington, D. C., one female in xylol-balsam (the original specimen). Homotypes were designated by Girault (1911, pp. 21–22).

12. **Polynema enchenopæ** Girault.

Since describing this species (Girault, 1911 a, pp. 15–18) I have seen the following specimens of it: A single female specimen found mounted on a tag in the collections of the Illinois State Laboratory of Natural History, Urbana, labelled "Chicago, Ill., X. 4. 1909", and collected by J. J. Davis. Also a single male specimen mounted in balsam and labelled "Greenhouse, Urbana, Ill., May 31, 1910. Girault." The species must be distributed at least throughout the northern half of the State of Illinois.

13. **Polynema bifasciatipenne** (Girault).

I have a female specimen of this species from the New York Experiment Station, labelled "*Œcanthus* eggs. Sep. 8, 1910. P. J. P. Coll. N. Y. Exp. Sta."; it was reared in New York State. Under the *nomen nudum œcanthi*, this species is recorded from New Jersey by Smith (1900; 1910) but evidently not from actual specimens. However, the species should occur there.

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DIAGNOSTIC TABLE

of the North American species of *Polynema* Haliday.—Females.

A. First funicle joint of antenna normal, short, distinctly shorter than the second (except *bifasciatipenne*).

I. Fore wings narrow, their marginal cilia longer than their greatest width, or as long, their discal cilia coarse.

1. Discal cilia of fore wing usually long like fine hair, as long as the longest marginal cilia of the caudal wings. Fore wings comparatively broad.

Marginal cilia long and fine, a fifth longer than the greatest width of the fore wing. Black, legs pallid yellow; second funicle joint of antenna a third longer than the third joint; marginal cilia of cephalic margin of posterior wing longer than usual.....**caesariatipenne** Girault.

2. Discal cilia of fore wing coarse but not long and hair-like; distinctly not as long as the longest marginal cilia of the caudal wings.

Marginal cilia of fore wing about equal to that wing's greatest width; about eleven lines of discal cilia.

Black, legs yellow.....**maculipes** Ashmead.

Marginal cilia of fore wing distinctly longer than that wing's greatest width, the fore wings more slender,

Species black, the thorax and legs yellow; wings broader, their discal cilia coarser and longer; second funicle joint barely longer than the pedicel.....**zetes** Girault

Species black, the legs pale yellow; wings very narrow, their discal cilia nearly normal; second funicle joint distinctly longer than the pedicel.....**longipes** Ashmead.

II. Fore wings broader, their marginal cilia shorter than their greatest width.

1. Fore wings with dusky fasciæ or spots. Species brown or black.

Species brown, the fore wings with three (two distinct) brown bands; proximal funicle joint long.

bifasciatipenne Girault.

Species black, the fore wings with two dusky, rounded spots; proximal funicle joint short, normal.

bimaculatipenne Girault.

2. Fore wings hyaline, species black.

a. Ovipositor exserted for two-thirds length of abdomen.

First three antennal joints, petiole and legs honey-yellow.

needhami Ashmead.

b. Ovipositor not or but slightly exserted; if exserted not for more than a fourth the length of the body of the abdomen.

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(1). Legs, excepting anterior coxæ and the femora, honey-yellow. Funicle joint 4 distinctly longer than joints 5 or 6.

Fore wings narrow, the longest marginal fringes only a third as long as the greatest wing width.

piceipes Girault.

(2). Legs chrome-orange; funicle joint 4 slightly shorter than joints 5 or 6 of the funicle.

Fore wings very broad and long, with from twenty-seven to thirty lines of discal cilia, the marginal cilia moderate in length .....**sibylla** Girault.

(3). Legs fuscous or darker, pallid at the articulations and tarsi only.

Second funicle joint of antennæ barely a third longer than the third joint, the latter relatively long; fore wings graceful, their discal cilation fine.

striaticorne Girault.

Second funicle joint of antennæ nearly a half longer than the third joint, the latter relatively shorter; fore wings broader.

Discal ciliation of fore wing relatively coarse.

enchenopæ Girault.

Discal ciliation of fore wing fine.

consobrinus Girault.

(Cf. male **graculus** and **howardii.**)

B. Second funicle joint of antenna abnormal, long, subequal to the second.

I. Fore wings broad, their marginal cilia much shorter than their greatest width.

1. Scape with a peculiar sculpture, serrate beneath; color black, marked with chrome-yellow; wings hyaline.

psecas Girault.

(Cf. **bifasciatipenne** Girault.)

STEPHANODES Enock (= *Polynema* Haliday).

1. (**Stephanodes**) **Polynema psecas** (Girault).

I have recently obtained specimens of the type species of this genus ("*elegans*" Enock) through the kindness of Mr. C. O. Waterhouse some time the well-known keeper of the section of insects in the British Museum. Also, I have found in my own collections a male of the American species, thus enabling a comparison of the two sexes of the species. The two species are very much alike indeed, surprisingly similar in details of coloration, notwithstanding what is said con-

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cerning this in the original description of *psecas* (in reference to the females alone). However (females) the two species differ as follows: *psecas* has the fore wings more graceful, narrower and not quite so long as in "*elegans*" (for instance while I can see the discal ciliation of the fore wings of "*elegans*" through a hand lens—triple aplanat. 25 mm., Bausch and Lomb—through the same lens it is not differentiated from the general wing surface in the case of *psecas*); in *psecas*, the first funicle joint of the antenna is distinctly longer than the second (the second distinctly longer than the first in "*elegans*"); of the three distal funicle joints in *psecas*, the intermediate one is the shortest, in "*elegans*" the longest of the three (about thirty longitudinal lines of discal ciliation in "*elegans*", in *psecas* about twenty-five, at the widest portion of the blade); the males of the two species are very similar; however in *psecas* the posterior wings lack any mid-longitudinal discal ciliation with the exception of two or three at apex, whereas in "*elegans*", there are ten or fifteen irregular cilia; the fore wings, of course, are also bróader as in the females. The male body and antenna are colored as in the female. The two species may be identical but deserve to be separated until more material has been studied; they must be closely allied and seemingly are the same thing, showing environmental variation. like the closely related native species of neighboring islands.

The following additional specimens: One male specimen captured at Mattoon, Illinois, July 16, 1910, on stable windows; a female taken in the same place at the same time; a female found on a tag in the United States National Museum collections labelled "From Webster. 4^{10} Unique"; also finally a female from the same collection bearing no data. Thus far it has been found only at Urbana and Mattoon, Illinois.*

* Subsequently, in the collections of the Illinois State Laboratory of Natural History, another headless specimen (female) recognized by its color and fine discal ciliation of the fore wing; this was on a tag numbered *1418* and was collected under mulch in a strawberry field, Normal, Illinois, March 27, 1884 (F. M. Webster).

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2. **Polynema enockii** Girault, nomen novum.

Stephanodes elegans Enock, 1909, pp. 457–458, pl. XIV, figs. 6–11.

Polynema elegans Foerster, Preoc.

The specific name *elegans* is preoccupied in *Polynema* and since *Stephanodcs* is synonomous with that genus, the name falls. If the species *psecas* and *enockii* prove identical, then *enockii* will hold. The species is British (England).

The reasons for considering *Stephanodes* synonymic with *Polynema* should be given and are as follows:

The teeth along the under side of the antennal scape are common to several species of *Polynema* and seem to gradate in others, without accompanying correlation. Thus in *Polynema striaticorne* Girault they are present and distinctly visible at times, but the proximal funicle joint of the antenna remains short and usual. In Polynema *reduvioli* Perkins, on the contrary, the unusual long proximal funicle joint of the antenna is present, apparently without the correlating teeth of the scape. Hence the characteristics of *Stephanodes* lose their value in being too variable and graduate and must be considered as having no more than specific value. There is nothing in the general appearance of *Stephanodes* to indicate a distinctness from *Polynema;* in appearance the genus is typically *Polynema*. I think the foregoing facts are sufficient, in themselves, to establish the identity of the two. The serration of the scape occurs in other genera, it being marked in (*Oophilus*) *Gonatocerus longicauda* (Enock), for instance.

The following notes on extraterritorial species are added:

Polynema brasiliense Ashm.

Ashmead, 1904, p. 521.

From the single female tagmounted, type specimen in the United States National Museum, labelled "Polynema brasiliensis Ashm. ♀ type" in Ashmead's handwriting, and "Chapada, April", I have taken the following notes:

Antennæ 9-jointed. Second and third funicle joints long and slender, subequal, twice the length of the first and fourth, which are subequal; fifth and sixth subequal, one-third shorter than the fourth or first; club an egg-shaped solid piece, abruptly enlarged and as long as either the second or third funicle joint; scape short; pedicel one-third

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shorter than proximal funicle joint. Ovipositor distinctly exserted but not for any length (about a third or less of the body of the abdomen). Sculpture of body polygonal figures, scaly. Scutellum with a line of round foveæ before its apex, following its outline; parapsidal furrows complete, widely separated, nearly straight; fore wing moderately densely ciliate but naked near the cephalic margin and for some distance out from the marginal vein excepting for a single line of cilia in the latter place and two short lines leading along the margin from the marginal vein in the former. Marginal cilia where longest, only between a third and a half of the greatest wing width. Posterior wing very narrow and slender, linear, without discal ciliation at all but a line of cilia along each wing edge; the marginal cilia of the posterior margin over four times the width of the wing blade. Fore wing distinctly fumated its entire length. Middle of metathorax elevated as in *bifasciatipenne*, the margins acute. Proximal tarsal joint as long as the other three united. Metathoracic spiracle minute, round. There is a carina leading from it, having its origin just off (caudo-mesad) of the spiracle, running nearly caudad, and another shorter one, oblique, running caudo-mesad from the lateral aspect toward the caudal end of the first, forming a more or less obscure V-shaped figure. Fore wings with about fifteen longitudinal lines of discal cilia, each cilium moderately long and the lines separated.

(Hym. slide 114, U. S. National Museum—pair of wings.)

Polynema rufescens Ashmead.

Ashmead, 1904, p. 521.

From the single male tagmounted type specimen in the United States National Museum collections, I have made the following observations. The specimen was labelled "Polynema rufescens Ashm. ♂ type. ♂ type No. 6595, U. S. N. M. Bnito Prov., Pernmbuco, Brazil. Feb. 83".

Body brown. Fore wings deeply fumated. Parapsidal furrows complete, curved, widely separated. Body shining, the sculpture nearly imperceptible, delicate, polygonal figures. Metathorax with the usual central triangular elevated portion, whose margins are carinated, and with two lateral carinæ, the first prominent, originating cephalo-laterad of the minute circular spiracle and running caudo-mesad to the mesal elevation and in front of the spiracle; the second is nearly parallel with the first but caudad of the spiracle, originating in the lateral aspect directly laterad of the spiracle, and running in a gentle convex curve caudo-mesad as to general direction but the curve finally caudo-laterad. The spiracle is between these, nearer to the first. Antennæ filiform, 13-jointed, the funicle joints with numerous long carinæ, stiff grey pubescence and gradually increasing in length

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distad except the club joint which is shorter than the preceding joint by about a third. Joints 2 to 10 subequal, longest, a third longer than the proximal joint, the scape subequal to them or slightly longer. Club joint and proximal funicle joint subequal. Pedicel globular, somewhat longer than wide. Lateral ocelli not touching the eye margins. Posterior wings hyaline but tip tinged with some brownish ; no discal cilia, excepting a double row along the edge of the caudal margin and a single row along the cephalic margin ; also some brownish just out from the marginal vein over the whole blade. Marginal cilia of posterior margin not more than twice the width of the wing blade which is not linear but acuminate and slightly curved. Whole of the blade of cephalic wing clouded, excepting the clear portion proximad of the end of the marginal vein and a less regular, less clear area just distad of a distinctly deeper band across the wing just at the end of the marginal vein (or stigmal vein). Marginal cilia moderately short, the longest only a fourth the greatest wing width. Discal ciliation uniform, about seventeen longitudinal lines. Marginal vein deflexed into a distinct, true stigmal vein, which is shaped like a snake's head. Discal ciliation not dense enough to obscure cilia. Scutellum not visible. Head behind the eyes longitudinally striate, the striations delicate.

(Hym. slide 118, United States National Museum—pair of wings).

From the foregoing and the following list of species, a complete catalogue of the North American Mymaridæ can be compiled. The added list is given for convenience. The remaining described North American species are:

1. *Limacis aspidioticola* Ashmead.
   Leimacis aspidioticola (Ashmead). Position uncertain and species unknown.
2. *Packardiella putnamii* (Packard).
3. *Alaptus iceryæ* Riley.
4. *Alaptus globosicornis* Girault.
5. *Alaptus intonsipennis* Girault.
6. *Alaptus caecilii* Girault,
7. *Alaptus eriococci* Girault.
8. *Anaphoidea conotrocheli* (Girault).
9. *Anaphoidea pullicrura* Girault. (Mentioned in foregoing.)
10. *Anaphoidea sordidata* Girault.
11. *Camptoptera clavata* Provancher.
12. *Camptoptera pulla* Girault. (Mentioned above.)
13. *Mymar venustum* Girault.
14. *Macrocamptoptera metotarsa* (Girault).
15. *Cosmocomoidea morrilli* Howard.

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The following *nomina nuda* exist:

Ooctonus homoladiscæ Ashmead.
Polynema oecanthi (= *bifasciatipenne*).
Polynema citripes (= *longipes*).
Polynema aspidioti Girault MS.
Discopus halitus Girault MS.
Anthemiella rex Girault MS.
Metamymar aleurodis Riley MS., 1885.
(And perhaps *Litus tenuipennis* = *longipes*).

In the list given by Nason (1906, p. 8), there occurs *Gonatocerus welateri* Ashmead a misprint for *websteri*, an MS. name never in print but found on specimens of *Gonatocerus anthonomi* Girault in the Nason Collection and in the collections of the United States National Museum.

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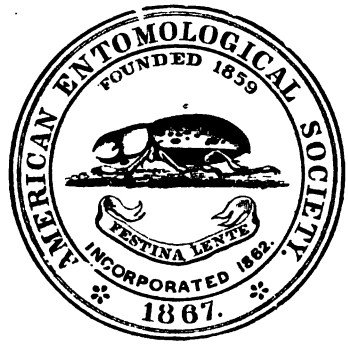

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Notes on CALLIGRAPHA and its Allies with Descriptions of a few New Species.

BY FRED. C. BOWDITCH.

A study of the Chrysomelids in my collection shows some interesting new forms.

Calligrapha wickhami nov. sp.

Head rufous with two flavous spots near the eyes, antennæ rufous, the club dark, thorax rufous, with the lateral and anterior edges flavous, the former with one dilation inward, the latter with three, the middle one attaining the centre of the thorax which has also two flavous spots on the disk, elytra flavous, the suture very narrowly, a short fork about the scutellum, a subsutural vitta interrupted near the scutel, a vitta on about the third space, also interrupted in front and developed into a hook on the convexity, a humeral and subhumeral stripe and several small spots at the side and behind all dark rufous and all limited by punctures, beneath and legs rufous.

One example Alpine, Texas, 4400–6000 feet. Wickham.

A striking species superficially resembling *Zygogramma exclamationis* Fabr. The thorax is moderately punctured on the disk, coarsely and thickly on the rufous parts of the side, scutel rufous; the flavous part of the elytra is almost devoid of punctures except at the sides and behind where they are few, fine and piceous; the punctured edges of the rufous vittæ, none of which attain the base, have a tendency to be darkened, the fork about the scutel unites with the sutural edge at about the anterior fourth, the subsutural joins it about one-fourth from the apex and is abruptly truncated near the apex, the vitta of the third space is broken at the anterior quarter, and the short end clubbed; just after passing the convexity it is hooked outward, the humeral stripe nearly touches the end of the hook, the subhumeral is short and touches the humeral, there is a small spot between the subhumeral and the edge, a larger one directly behind the subhumeral, four more arranged around the hook, and two small ones in the rear, the epipleuræ are flavous with rufous edges, the edges of the body parts below are more or less picked out with dark.

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Probably mixed in collections with *Z. exclamationis*, but the claws at once differentiate it, and the striping differs.

Calligrapha serpens nov. sp.

Head green bronze, labrum yellow, antennæ yellow with dark club, thorax green bronze, coarsely punctate at the sides, sparsely and finely on the disk, deeply foveate on each side, elytra flavous, brown vittate as follows: a narrow sutural vitta, forked at about the centre, forming the vitta of the second interspace, the vitta of the fourth interspace is entire from the base down over the convexity, where it turns outward running nearly parallel to the lateral edge, and forming a long hook reaching to the anterior fourth, at the bottom of the hook, near the outside edge is attached a small supplemental hook, curved inward parallel to the suture, a humeral vitta which is prolonged over the elytra and occupies the centre of the space formed by the hook of the fourth interval and is clubbed at the end, there is a small spot below the humerus and a median one on the edge, body below and epipleuræ, blue green, feet rufous. Length 9 mm.

Two examples, Guanajuato, Mexico.

The sides punctures of the thorax are very coarse and confluent, the edges evenly rounded, the scutel the color of the thorax, the vittæ of the elytra nowhere attain the base, the long hook coupled with the abnormally long humeral stripe easily identify this form. There are a few fine punctures on the side and rear portions of the elytra, all the elytral vittæ are limited by punctures.

There is a form of Calligrapha *lunata* Fabr. where the usual short white inner discal stripe is reduced to an obsolete spot; at the same time the sutural white stripe ends abruptly about 2 mm. from the apex, otherwise it is strictly typical, but unless the ordinary form is at hand it would readily pass as a new species.

One example, Mexico (in green), No. 429 among the unnamed Jacoby material, also one from Marion, Mass.

Leptinotarsa similis nov. sp.

Head and thorax viridi-aeneous bronzed, labrum and antennæ flavous, the latter a trifle darkened at the end, punctures moderate except at the sides of the thorax where they are coarser and somewhat confluent, also a deep fovea on each side, scutel aeneous, elytra pale flavous with the following aeneous markings, a common wedge shaped sutural vitta ending at the middle, a subsutural vitta nearly reaching

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the apex and three vittæ (one humeral) between the last and the humerus, ending in an ill-defined oblique streak which runs from below the humerus to the middle, the space between the oblique streak and the apex is occupied by broken fragments of aeneous coloring without order, the two or three outside vittæ, above mentioned, are connected with a very narrow basal aeneous margin, and there is also a lateral vitta from near the humerus to within one-quarter of the apex, body below greenish bronze, feet yellow with viridi-aeneous spot on the thighs. Length 8–9 mm.

One example, Mexico, also one among the unnamed Jacoby material marked "Coll. R. Stuhimann 16 XI 1895 (viri-di-collis separate label)." Separate label in Jacoby's writing.

The second specimen varies from the type in having the humeral vitta broken and the oblique streak indicated by spots, and the broken fragments behind are still more divided. The sides of the thorax are rounded and the anterior angles pointed, the elytral puctures are moderately coarse, obsolete at the apex and almost entirely confined to the aeneous markings, the third interspace is wider than the rest. The junction of the oblique streak with the subsutural vitta forms a noticeable spot, the vittæ in front of the oblique streak are limited by punctures like a Calligrapha, but the crossing of the streak seems to break all order. Resembles some forms of *dilecta* Stål, but the punctuation of the elytra in *dilecta* is much more general and diffused, and none of my specimens of *dilecta* have anything approaching the broken rear markings of *similis*.

Among the unnamed Jacoby material was a specimen marked by him "n. i. m." (not in museum) which seem to be a curious aberration of *Leptinotarsa* Stäli Jac. it is precisely like typical *Stäli* except that the large angulated spot at the rear side and the small jog off the sutural vitta near the apex, are both indicated only by dots at the anterior angles—without typical forms for comparison it would pass as an undescribed form.

Mr. Wickham in one of his trips has taken *Leptinotarsa dahlbomi* Stål at the Rio Balsas and Apipilulco in Guerrero and also at Cuernavaca; new localities to me for this species.

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Leptinotarsa vittipennis nov. sp.

Head and thorax dark shining metallic green, labrum rufescent, antennæ dark, punctuation of the head moderate and uniform, diffuse on the thorax and coarser at the sides, scutel dark, elytra dark flavous, coarsely, diffusely punctate, except on the disk where it is semi-regular with a common sutural vitta which is suddenly widened just before the middle and abruptly narrowed after the middle, to a thin line which attains the apex; a broad (about 1 mm.) oblique vitta from the humerus to a point about one-third from the apex, but only attaining the convexity, and a small elongate subbasal spot between the two vitta, all of which are the color of the thorax, body below and legs dark greenish black. Length 9 mm.

One example, Peru, pale green label (Marcapata ?).

The suddenly narrowed sutural vitta and the broad oblique humeral stripe make this a conspicuous form. The antennæ are long and approach the form of *Prosicela*, but the outer joints are widened; the surface of the thorax is polished and the punctures rather sparse except on the rear edge; there is a well marked quasi arcuate fovea near the hind angle, the punctuation of the elytra is moderately coarse and diffuse except for a few short striæ on the disk.

Desmogramma semifulva nov. sp. (Jac. in litt.).

Head and thorax sanguineous, moderately punctured, labrum blackish, antennæ black, basal joints rufous, scutel black, elytra dull greenish black, moderately punctate striate, the third, fifth and ninth intervals and the basal margin light flavous, the light intervals wider than the others, the ninth the widest of all, all three joining just before and then reaching the apex, body beneath and legs dark black green, coxæ rufous. Length 7 mm.

Two examples, Callanga, Peru.

This species is labelled *semifulva* Jac. as I am unable to find the description I give the above, the elytral striping much resembles *Ljunghi* Stål or *Nigripes* Jac., but the bright red thorax and the dull black of the elytra in conjunction with the light vittæ distinguish it. The punctuation of the thorax is as usual a little thicker and coarser at the sides which are rounded with pointed anterior angles; the elytral punctures are fine, and the dark surface noticeably dull shiny.

Desmogramma jacobyi nov. sp.

Head and thorax dark, dull green bronze, labrum tinged with rufous, antennæ of the same dark green with rufous basal joints below, punc-

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tuation sparse except at the sides of the thorax where it is more evident but not crowded, scutel aeneous, elytra strongly and regularly punctate striate, aeneous bronzy black, with the third, fifth, seventh and ninth intervals as well as the basal margin flavous, the fifth and seventh joining at the rear of the convexity, the third and ninth joined near the apex and continued to it, body beneath and legs dark shining black green. Length 7–8 mm.

Two examples, St. Catarina Lüderwaldt, also No. 420 marked "n. i. m." by Jacoby.

Comes near *polychordia* Er. but with one less flavous vitta. The sides of the thorax are nearly straight behind and the surface is noticeably dull, the color of the elytra is brown and the thorax is greenish, the light vittæ are wider than the dark spaces, and the ninth noticeably the widest of all, the sutural dark stripe is hardly contracted at the base, but becomes attenuated at the apex, which is attained by the conjunction of the flavous vittæ.

Desmogramma buckleyi nov. sp.

Head black, dull shiny, rather thickly punctate, labrum rufescent, antennæ black with basal joints rufous, thorax black shining, punctures coarse and crowded at the sides becoming sparse and fine on the disk, scutel black, obsoletely channelled behind, elytra black, sparsely gray sericeous, coarsely and diffusely punctate, punctures crowded at the sides and somewhat obsolete behind, and more sparse on the disk, each elytra with two red spots, one basal median, the other subsutural post median, body beneath and legs black. Length 7½ mm.

One example, Ecuador (Buckley), unnamed in the first Jacoby coll.

Nearly allied to *rufofasciata* Kirsch but the anterior elytral spot in place of being transverse and almost median is small, somewhat elongate longitudinally and strictly basal, the rear spot is smaller and more rounded. The thorax is distinctly foveate depressed in the coarsely punctate area at the sides, the lateral edge is parallel behind, abruptly rounded in front and with sharp pointed anterior angles, the thorax is less punctured than in *rufofasciata*, and in the latter species the elytral punctures are much more uniformly coarse and crowded, the apex of the elytra is absolutely rufescent.

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Desmogramma reticulata nov. sp.

Head and thorax dull bronzed green, the labrum and base of the antennæ rufescent, punctuation moderate and sparse, the thorax depressed laterally, anterior angles finely refescent, scutel of the same bronzed green, elytra bright shining rufous, moderately punctate striate, confused at the sides and behind, each with a common sutural stripe narrowed behind, an elongate humeral spot, a transverse irregular median band sometimes not attaining the suture and an elongate irregular post median spot, greenish black, body beneath and legs dark greenish black. Length 7½ mm.

Two examples, Colombia, first Jacoby coll.

The shape and size of *rufofasciata* Kirsch. The sides of the thorax are nearly straight behind, moderately rounded in front, the front angles not produced, the lateral fovea of the thorax is vague and more median than usual: in one specimen the humeral mark touches the median band, the rear mark does the same, the effect being to make two large basal rufous spots near the suture, another at and surrounding the humerus and two submedian (ill-defined behind), side by side, specimens probably occur where the whole surface is divided into rufous spots. It is the only red spotted species known to me where the elytra are smooth polished.

Desmogramma santos nov. sp.

Ovate parallel; head dull alutaceous black with labrum and antennæ dull yellow, thorax the color of the head with a few scattered punctures, especially noticeable at the sides which have a small well-marked fovea, scutel dull black, elytra dull flavous finely striate punctate, obsolete behind with a common broad sutural vitta, a subbasal transverse fascia, obsolete back of the shoulder, a similar sub-median fascia, semi-obsolete near the suture and the apex broadly excepting the extreme tip, all dull alutaceous black, below with legs shining black, except that the transverse black bands are carried round and include their proportionate share of the epipleuræ. Length 8½ mm.

One example, Epirito Santo, Staud., '98, among unnamed material of Jacoby collection.

Somewhat resembles *Metastyla nigrofasciata* Stål. The anterior angles of the thorax are much produced and together with the whole lateral edge much thickened, the scutel and immediately about it is semi-shining all the remainder of the upper surface is dull, the black apical area bears a round yellow spot at the apex; the black bands do not have clear cut edges, but rather the reverse.

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Desmogramma unicolor nov. sp.

Elongate, parallel, aeneous bronzed. Head and thorax smooth semi-shiny, a few obsolete depressions on either side of the latter, which has almost straight sides, with anterior angles elongate and obtuse, elytra barely wider than the thorax, with very finely punctulate striæ which are barely discernable at the sides and rear, the shoulder knobs are semi-prominent and semi-sulcate within, the elytra are markedly declivous behind after the manner of *D. ludicra* Stål and *obliqua* Stål, beneath and legs shining bronzy black. Length 10 mm.

One example, Naranja, Nicaragua.

Owing to the very divergent claws I have some doubt about placing this form in *Desmogramma*, but the truncate prosternum, which is so characteristic, finally decided me to locate it here, at least for the present; the shape and uniform color will at once distinguish it, the few punctures adjoining the scutel are more evident than the others.

Desmogramma callangaensis nov. sp.

Head and thorax dark bronzed green, labrum, mouth parts and antennæ rufous. Head with a few scattered punctures, thorax moderately and rather sparsely punctate on the disk, more frequent at the sides, elytra regularly and rather heavily punctate striate, blue bronze, with the third and ninth interval and the basal margin almost to the scutel flavous, the two intervals uniting near and then extending to the apex, body beneath blue black, legs rufous. Length 7 mm.

One example, Peru (green label Callanga or Marcapata ?), one La Merced, Peru.

Very near *biva* Germ. but separated by the rufous legs and antennæ; the specimens were among the Jacoby beetles and placed by him as *bivittata* Lj. This latter species and *bisbivittata* Stål do not have the basal margin flavous, *conjugata* Stål is dull rufous bronze with much finer punctures and is confined apparently to Colombia and Venezuela, *fastidita* Stål has a dull alutaceous finish, while *bigaria* Er. and *bivia* Germ, both have dark legs and antennæ. The sides of the thorax are straight behind, with the anterior angles acutely produced—the third interval is narrowed behind.

Desmogramma foveicollis nov. sp.

Head and thorax dull rufous sanguineous, finely and sparsely punctulate, mouth parts and antennæ blackish rufescent, thorax with a

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Desmogramma reticulata nov. sp.

Head and thorax dull bronzed green, the labrum and t
antennæ rufescent, punctuation moderate and sparse, the
pressed laterally, anterior angles finely rufescent, scutel
bronzed green, elytra bright shining rufous, moderately
ate, confused at the sides and behind, each with a co
stripe narrowed behind, an elongate humeral spot, a
gular median band sometimes not attaining the suture
irregular post median spot, greenish black, body b
dark greenish black. Length 7¼ mm.

Two examples, Colombia, first Jacoby co

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Desmogramma santos nov. sp.

Ovate parallel; head dull alutaceous black
dull yellow, thorax the color of the head
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One example, Epirito Santo, Sta
material of Jacoby collection.

Somewhat resembles *Metastyla*
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by material and ten others
all but one labelled Mexico

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large deep fovea each side of the middle and an additional small one between it and the lateral anterior edge, scutel flavous, elytra very finely punctulate striate, dull flavous, the suture and alternating interspaces including the margin narrowly black vittate, below with legs, aeneous, blackish, rufescent. Length 7½ mm.

One example, St. Catharina, Brazil (ex Klages).

Allied in marking to *polychordia* Er. The thorax is noticeably much thickened on the sides, which are straight behind; much rounded, in fact, almost angulate in front, and with the anterior angles short and pointed. The elytra striæ are very fine, in longitudinal depressions so that the intervals appear raised, giving the elytra a sulcate appearance, the sutural vitta vanishes at about the apical third, the subsutural and marginal almost attain the apex, the second and fourth (counting on the disk) are a little shorter and the third ends at the apical third—easily separated by the sulcate appearing elytra and foveate thorax—the second flavous interspace is noticeably swollen and protuberant at the base, and all the spaces both yellow and black appear as if ridged in middle.

Desmogramma brunneo-maculata nov. sp.

Head, thorax, antennæ, legs and underside dark brownish-black, the antennæ and mouth parts somewhat rufous, head and thorax sparingly punctate, the latter a trifle more so at the sides, scutel brown-black, elytra dark orange fulvous red, with a common sutural vitta covering the second interspace, and the lateral margin dark brown, also on each elytra at anterior third two small indefinite brown dashes on the fourth and sixth intervals, also behind the middle on the same intervals two other dashes of similar color, the outer much longer and stronger. Length 8 mm.

One example, Venezuela.

The sides of the thorax are almost uniformly rounded and the anterior angles short and pointed. The stria of the elytra are fine and regular, except 5–6 is broken in the middle with closed ends; the apex is practically fulvous, the extension of the black vitta showing only a faint blackish streak, the lateral brown vitta extends only to the tenth stria of punctures.

Desmogramma ignotus nov. sp.

Head and thorax pale rufous (antennæ broken) punctuation of the head fine, thoracic punctures coarse and scattered on the disk, gross

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and semi-confluent at the sides which are thickened and swollen, scutel smooth rufous, elytra finely and regularly punctate striate, partially obsolete behind, flavous, each with the suture and the third, fifth, seventh and ninth intervals pale rufous (like the thorax) beneath with legs pale rufous. Length 9 mm.

One example without locality label in the first Jacoby coll. (north part of North America?).

Very much resembling in appearance *Stilodes* (*Deuterocampta*) *fuscolineata* Stål, but the heavily punctured and swollen thoracic edges together with the prominent and truncate prosternum at once separates it. The sides of the thorax are rounded almost from the rear, the anterior angle is elongate, but not mutic, the disk is a little depressed at the anterior middle, but there is no fovea, the elytra are convex and polished, the third and fifth rufous intervals attain the base or very closely, all become more or less obsolete towards the apex. The fifth stops at the posterior quarter, the third and seventh faintly join near the apex, the first three flavous interspaces have a single line of punctures in the middle, becoming obsolete at the rear; the general form is narrowed toward the rear.

Zygogramma clavareaui nov. sp.

Elongate parallel, head and thorax dirty flavous with the edges and centre indefinitely rufous, antennæ flavous, with the last four or five joints dark, jaws black, a few medium punctures on the front, thorax dull, a few fine punctures on the disk, and very coarsely and somewhat confluently punctate towards the lateral margin, which is thickened and smooth, scutel rufous, elytra dirty dull flavous with the suture and alternating interspaces rufous, limited by strong punctures of a somewhat darker color, none of the rufous vittæ attain the base, the first or subsutural attains the apex, the second ends on the convexity, the third is undulated just behind the middle and almost broken near the apex where it undulates again and joins the first vitta, the last vitta is straight and obsoletely attains the apex, the undulation of the third vitta makes a suddenly wider interval which is very noticeable, the first and second vittæ are also obsoletely undulated in keeping with the third, the various flavous intervals show punctures more or less arranged in lines of which one of the most noticeable is the subhumeral; body below and legs rufous. Length 5–5½ mm.

Two examples among the Jacoby material and ten others sent me by Monsieur Clavareau, all but one labelled Mexico

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(light shiny green paper label). The amount of punctuation and amount and degree of rufous coloring vary considerably, and in some of the specimens the rufous vittæ all fall short of the apex, but all have the noticeable dilated area between the third and fourth vittæ, some examples have the front of the head quite thickly punctate, the rear edge of the thorax strongly punctate, and scattered strong punctures on the various elytral intervals at the sides.

Zygogramma lineatipennis nov. sp.

Head, thorax, body below and legs dark, dull, greenish bronze, antennæ the same, more or less rufous near the base, head with a few fine punctures, thorax sparsely and very finely punctulate on the disk, coarsely, but not densely on the sides, scutel shining black, elytra straminous, the suture infuscate in the anterior half, each elytra with nine rows (excluding the short sutural) of dark punctures impressed in a dark line, joined in pairs 1–2, 3–4, 5–6, the second pair the shortest, reaching the middle of the posterior half; none reach the base. Length 6 mm.

Three examples, Miranda (Andreer).

The sides of the thorax are nearly straight behind, the anterior angles are moderately prolonged, and each side of the disk shows an obsolete fovea. The third interval on the elytra cuts off the next two pairs of striæ, giving a regular look to the striation; should be placed near *deleta* Stål.

My two examples of *Zygogramma curvato-lineata* Jac. come from British Guiana and differ from the described type by having all of the three (in place of two) anterior short stripes connected together behind by a transverse band which is attached to the sutural vitta, also the exterior curved line at the rear, lacks only about one-third of a complete circle; the general form is almost that of Elytrosphæra—the type is described from Costa Rica.

Among the specimens labelled *Cosmogramma Ida* Stål in the first Jacoby collection I have detected a specimen of *Zygogramma decora* Stål var b, unfortunately only labelled Brazil; its purplish sericeous elytra with narrow flavous vitta makes it a very handsome thing. It is the only example I have seen and seems rare in collections.

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Descriptions of New Species of North American Neuropteroid Insects.

BY NATHAN BANKS.

In the following pages besides the descriptions of various new species of our Neuropteroid insects are synoptic tables of several genera, particularly of *Raphidia* and *Rhyacophila*. That of *Raphidia* is preliminary to a revision of our species of the family which is so abundantly represented in the western parts of our country. Of the two new genera of caddice flies, *Phanopsyche* is very peculiar on account of the venation of the hind wing, in which two veins are united for a considerable distance.

PERLIDÆ.

Perla slossonæ n. sp.

Head yellow with a large, median, dull black spot over ocelli and scars, and down to the clypeus; ocelli small, posterior ones wide apart, fully as near to eyes as to each other, the basal two joints of the antennæ black, then yellow, beyond dusky; pronotum very short and broad, anterior and posterior margins convex, dull black, a broad median pale stripe, thorax and abdomen black, somewhat shining, dull, and finely haired below; setæ nearly as long as abdomen, dull black, knees pale. Wings rather short, faintly dusky, venation black, except basal part of hind wings, radial sector usually with two branches beyond the anastomosis. In male the dark head-mark includes a pale spot between the posterior ocelli, and a transverse pale mark in front of the anterior ocellus. In the male the penultimate ventral segment of abdomen is slightly produced in a yellow median lobe; the ventral plate of female is very broad and evenly convex on top.

Expanse 26 mm.

From Franconia, N. H. (Mrs. Slosson).

Isoperla bellona n. sp.

Pale dirty yellow, brownish or black in the ocellar region, sometimes not plainly marked; antennæ except basal fourth dark, pronotum marked with black on the rugæ each side, and on front and hind margin, rest of thorax pale, with a dark spot each side on front of mesonotum; abdomen yellowish brown; legs and setæ pale, tarsi and tips of setæ dark; wings faintly brownish yellow, venation brown. Anterior ocellus barely nearer to hind ocelli than those to each other, and

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these as far from eyes as from each other; pronotum nearly twice as broad as long, sides straight, subparallel, hind angles square, hind and front margin both slightly arcuate; joints of setæ not very long.

Expanse 20–22 mm.

From Black Mountain, North Carolina, May, It varies much in depth of coloration.

Alloperla nanina n. sp.

Pale yellowish; antennæ, except pale base, is dark brownish; pronotum brown, except the pale margins; dorsum of thorax and abdomen brown; setæ and legs pale; wings pale yellowish hyaline, venation entirely pale. Anterior ocellus as near to antennæ as to the posterior ocelli, and a little nearer to them than they to each other. Pronotum narrower than head, one and a half times broader than long, truncate in front, sides slightly convex, hind angles broadly rounded. Wings with fork of radial sector about one and a half times as long as pedicel, only about two or three cubital and median cross-veins.

Expanse 16 mm.

From Black Mountain, North Carolina, north fork of the Swannanoa River, May. Easily known by the dark pronotum and small size, the smallest so far known in the genus.

Alloperla continua n. sp.

Pale yellowish, a dark median stripe on pronotum and continued more or less plainly on the vertex of head between ocelli, posterior margin of scutelli black, a median black streak on abdomen above; the antennæ beyond middle blackish, wings with pale venation. Anterior ocellus nearly as far from the posterior ocelli as they from each other, and these as near to each other as to eyes; pronotum nearly twice as long as broad, but little rounded in front, sides and hind angles broadly rounded, each side of disc rugose; setæ short. Wings rather long, fork of radial sector more than twice as long as pedicel, this and the anastomosis darker than other veins, four or five median cross-veins.

Expanse 18–21 mm.

From San Gabriel Mountains, California, 3000 feet, 17 June (Grinnell); Pasadena, California, 19 June (Grinnell), and mountains near Claremont, California (Baker).

Alloperla mediana n. sp.

Pale yellowish; antennæ blackish beyond basal third, palpi marked with black; pronotum with a median black streak more or less distinct, sometimes quite wide, sometimes with only a median line and one or two ridges near by marked with black; the posterior margin of

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the scutelli black, a median black stripe on dorsum of abdomen; tip of tarsi black, and a faint mark on knees. Wings pale, venation pale, except rather darker beyond middle. Anterior ocellus not much nearer to posterior ocelli than they to each other, and these a little farther apart than from the eyes; pronotum very broad, about elliptical, the anterior margin a little rounded, the sides and hind angles broadly rounded; setæ very short; wings rather long, the fork of radial sector usually not twice as long as pedicel, about four median cross-veins.

Expanse 18 to 20 mm.

From Black Mountain, north fork of the Swannanoa River, North Carolina, May; also Gloversville, N. Y., 13 June (Alexander).

Alloperla lateralis n. sp.

Pale yellowish; antennæ black beyond middle, palpi dark; pronotum with black margin all around; abdomen pale, a median black streak on dorsum; setæ and legs pale, tarsi dark; wings hyaline, venation pale, but the cubital and its branches, the anastomosis, and the radial sector beyond it usually dark. Anterior ocellus much smaller than posterior ocelli, and much nearer to them than they to each other, which is about their distance from the eyes; pronotum twice as broad as long, truncate in front, posterior corners very broadly rounded, each side rugose on the disc; setæ very short. Wings rather long, fork of radial sector nearly twice as long as its pedicel; about four or five median cross-veins.

Expanse 18 to 22 mm.

From Black Mountain, north fork of the Swannanoa River, North Carolina, May; and Gloversville, N. Y., June (Alexander).

Nemura venusta n. sp.

Yellowish brown; antennæ nearly black; femora dark at tip; tibiæ at base and tip, and all tarsi blackish. Fore wing a uniform deep brown, with about 35 large, clear, whitish rounded spots in the cells, disposed rather regularly over the surface, but none in basal costal area and few indistinct in anal area; hind wings uniform dusky brown. Head finely hairy; ocelli much nearer to eyes than to each other; antennæ very long and slender; pronotum nearly square, posterior angles sharp, strongly rugose above on each side. Wings moderately long, about six median and five cubital cross-veins.

Length 9 mm.

From Huachuca Mountains, Arizona (Oslar). Readily known by the spotted wings.

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RAPHIDIDÆ.

Raphidia arizonica n. sp.

Head blackish green, with usual reddish streaks; basal joint of antennæ dark, beyond pale for about one-third way out, then black; pronotum dark, yellow on sides, pale reddish on anterior one-fourth, behind with three reddish streaks; rest of thorax black, a pale spot on middle lobe of mesonotum, and on metascutellum; abdomen greenish black, hind borders of segments narrowly yellow, last ventral in both sexes mostly pale; legs pale. Wings with black veins except at extreme base, where they are yellow, stigma yellowish brown, moderately long, nearly as long as first cell below, four cells below. Head not very elongate; the male has upper piece of genitalia with a projection at lower tip; in female the last ventral segment is slightly produced in the middle.

Expanse 25 mill.

From Phoenix, Arizona (Oslar).

The shape of male genitalia is characteristic, and the mostly dark pronotum will often separate it.

Raphidia distincta n. sp,

Greenish black; a median, reddish stripe behind on vertex, lateral stripes not distinct; basal joint of antennæ a little dark, beyond pale, and then dark again; pronotum paler on anterior fourth; thorax unspotted; abdominal segments very narrowly paler behind; legs pale, hind femora brown or black. Wings with black veins, stigma dark brown. Head rather short, diamond-shaped, pronotum narrow, as long as head. Wings rather short, subcosta ending only a little beyond middle, four hyaline spots on veins, one being in middle of hind edge of the second cell under stigma, only three of these cells; the stigma is very peculiar, it is short, broadened behind, and reaches beyond the cell below it to the upper edge of the vein from the tip of the cell. Last ventral segment of female truncate; male appendages as figured and very characteristic.

Expanse 14–16 mm.

From Mt. Pinos, Kern County, Saw Mill Cañon, Kern County, and San Gabriel Mountains, Los Angeles County, all California, and taken by Mr. Fordyce Grinnell in June.

Raphidia astuta n. sp.

Basal joint of antennæ pale; hardly any pale in front of antennæ; vertex with usual pale stripes; pronotum pale in front, behind with streaks like those of *R. adnixa;* abdomen black, venter pale; legs pale. Wings rather slender, four (or sometimes five) cells under the stigma, which is rather long, and unicolorous pale yellowish; the

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lower genital plates of male meet on the median line (as in *adnixa*), but seen from the side they are more rounded outward and less sloping than in that species; the upper male appendages taper toward the tip. The posterior sides of the head are less rounded than in *R. adnixa*.

Expanse 23–26 mm.

From Pasadena, 31 May, 29 June; San Gabriel Mountains, 17 June, Mt. Wilson, 5 June, all from Southern California (Grinnell).

Our species of *Raphidia* can be tabulated as follows:

1. Besides the usual three white dots on veins of fore wings there is a fourth situate on middle of posterior side of the second cell below stigma; bristles of veins very short; only three cells under stigma.....2.
   Only the usual three white dots on veins; bristles of veins plainly visible .....3.
2. Stigma reaching one-half beyond the cell below it.....**distincta.**
   Stigma not reaching beyond the cell below it.....**minuta.**
3. Basal joint of antennæ as pale yellow as the second joint.....4.
   Basal joint of antennæ dark.....6.
4. Five cells under stigma; large species; last ventral of female slightly prolonged; stigma very long..... .....**assimilis.**
   Four cells under stigma, small species.....5.
5. Head pale in front of antennæ; superior male appendage truncate. **adnixa.**
   Head barely paler in front; superior male appendage sloping to the tip.....**astuta.**
6. With but three cells under stigma, which is very short, often more or less bicolored.....**bicolor.**
   With four cells under stigma, which is longer, unicolorous (sometimes the number of cells is five or rarely three).....7.
7. Anterior third or fourth of pronotum pale; upper male appendage with apical point below..... .....**arizonica.**
   Anterior half of pronotum pale; upper male appendage without point below .....8.
8. Head narrower behind; upper male appendage quadrangular, lower plates meet on median line.....**occulta.**
   Head broader behind; upper male appendage triangular; lower plates are bent out in the middle exposing a cavity...**oblita.**

CHRYSOPIDÆ.

Chrysopa canadensis n. sp.

Yellowish; a black mark on each cheek, a vertical mark between the antennæ, divided above; palpi marked with black; second joint of antennæ black; pronotum broader, sides subparallel, with four

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black dots forming a transverse row across the middle, a few spots on lateral lobes of the thorax; abdomen short, dark; legs pale. Wings with pale longitudinal veins, but almost all of the cross-veins are black, including the divisory, origin of radial sector, branches of radial sector, and anal veins; a small black cloud over the base of the radial sector; stigma distinct; hind wings with mostly pale venation, but the cross-veins are black at bases. Wings rather short, rounded at tips, second cubital cell nearly as long as third, slender, the third not much widened at tip, divisory veinlet ends beyond cross-veins, inner series (of only three or four veins) as near to radial sector as to the outer row; in hind wings the radial sector unites to median only for a short distance.

Expanse 21 mm.

From Go Home Bay, 12 July, Lake Huron, Can. (Walker).

Chrysopa excepta n. sp.

Green; a prominent black stripe on each cheek from eye to mouth; antennæ black, except basal joint, which has a black line on the outer side; the outer side of each antennal socket is narrowly margined with black; palpi marked with black; thorax green, unmarked, pronotum broad, but plainly narrowed in front; abdomen pale; legs pale yellowish. Wings with green venation, costals and many cross-veins mostly black, but the gradates are pale; in hind wings the costals only black; stigma distinct in both pairs. Wings moderately long, rounded at tips, with inner gradate series (of four or five veins) about as near to radial sector as to outer row; second cubital cell no longer than the third, latter very broad at tip, divisory veinlet ends beyond the cross-veins; in hind wings the radial sector unites with the median only for a short distance.

Expanse 27 mm.

From Ft. Wingate, New Mexico, 25 July (Woodgate); near to *Ch. lineaticornis*, but the mark on cheek separates it, and in that species the inner gradate series is nearer to the outer than to the radial sector.

Chrysopa incompleta n. sp.

Greenish; second joint of antennæ not black; a black band across the face just beneath the antennæ, a black spot on each cheek, and one on each side on the clypeus, no marks on the upper antennal sockets, two black stripes on the vertex; palpi marked with black; pronotum broad, sides parallel, narrowed in front, and the anterior outer edge black; abdomen dark; legs pale. Wings with green venation, the costals and radial cross-veins wholly black, other cross-veins black at bases, gradates dark; in hind wings the costals and bases of other cross-veins dark; stigma distinct in both pairs. Wings broad, rounded at tips, second cubital cell no longer than the third,

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narrowed at tip, the third very broad at tip, divisory veinlet ends beyond cross-vein, inner gradate series (six to eight veins) as near to radial sector as to the outer row; in hind wings the radial sector unites with the median for nearly a cell length.

Expanse 27 to 29 mm.

From Beaufort. North Carolina, 15 May (Woglum), and Raleigh, North Carolina, 15 July (Sherman). Differs from *Ch. oculata* in clypeal marks and less marked antennal sockets.

Chrysopa separata n. sp.

Close to *Ch. oculata* and *Ch. chlorophana*, but differs by the narrow straight mark on the cheeks that is not connected, nor bent up to the antennal mark; there is much red on the clypeus in form of a spot each side; there are no marks on the vertex; the basal joint of the antennæ is more or less red above; the anterior narrowed part of the pronotum is black on the edge. The wings have pale venation, the costals black at ends, the base of the second cubital cell and the two cross-veins behind it are black; in the hind wings the costals are dark. Wings hardly broad, the second cubital plainly longer than the third, latter broad at tip, the divisory ends beyond the cross-vein; the inner gradate series (of seven to nine veins) is much nearer to the outer row than to the radial sector.

Expanse 23–26 mm.

From Chimney Gulch, Golden, Colorado (Oslar), and Pecos, New Mexico, 23 June (Cockerell).

Some specimens show black at bases of branches of the radial sector, and radial cross-veins.

Chrysopa pleuralis n. sp.

Green; second joint of antennæ black, basal joint reddish; face marked as in *Ch. oculata*, the marks over the antennal sockets continued back on the vertex, a posterior transverse black line on vertex (not seen in *Ch. oculata*); pronotum very broad, sides parallel, anterior margin rounded, with an interrupted black line near each outer side, and indistinct black spots within; rest of the thorax unmarked above, but the pleuræ have a black line under each wing to the base of the legs and a few transverse lines as shown in the figure; abdomen dark greenish; legs pale. Wings with green venation, and distinct green stigma, the costals black at each end, and many other cross-veins black in part, the gradates mostly dark, also the bases of the branches of radial sector; in hind wings the gradates are pale, and costals wholly black. Wings moderately broad, broadly rounded at tips; second cubital cell rather larger than the third, divisory veinlet ending much beyond the cross-vein; inner gradate series as near to radial sector as to outer series;

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in hind wings the radial sector unites with median for only a short distance.

Expanse 28 mm.

From North Boulder Creek, Boulder County, Colorado, 21 August (Rohwer), and Steamboat Springs, Colorado, 27 May (Cockerell).

Chrysopa furcata n. sp.

Pale greenish; antennæ wholly pale; head whitish, face with a furcate red stripe each side extending up from mouth to the base of the antennæ and to the eyes; pronotum broad, sides parallel, anterior margin convex, green, with a broad median whitish stripe, which is continued back over the rest of the green thorax; legs pale; abdomen pale green. Wings with green venation, costals and gradates almost wholly black, many other cross-veins, branches of the radial sector, and divisory veinlet in part black; stigma not very distinct; in hind wings the venation is less marked with black. Wings long, slender, acute at tips; second cubital cell not as long as the third, which is widened at the tip, the divisory veinlet ends much beyond the cross-vein; inner gradate series (of only five veinlets) nearer to the outer than to the radial sector; in the hind wings the radial sector unites with the median for nearly a cell length.

Expanse 30 mm.

From Ft. Wingate, New Mexico. 19 July (Woodgate coll.). One specimen has the sides of the thorax faintly, broadly purplish. It is in the group of *Ch. rufilabris*, but distinct by markings of the face; also from Stanford Univ., California.

Chrysopa signatalis n. sp.

Yellow (or green in life); head with light red markings; a transverse mark across below the antennæ, one at base of the clypeus, connected at sides to other mark, and running up on inner orbits to the vertex where it widens; sometimes a line each side on vertex nearly meeting in front, and a pair of faint marks on the middle of vertex; antennæ wholly pale; thorax, abdomen, legs, and wings all pale greenish, unmarked; pronotum rather short, narrowed in front. Wings long and slender, acute at tip, venation green, stigma distinct; second cubital cell long, narrower at tip than in the middle, third still longer, wide at tip, divisory veinlet beyond the cross-vein; four or six veins in inner gradate series, about eight or ten in outer series, the two series much nearer to each other than either to margin or to radial sector.

Expanse 30 mm.

From Brownsville, Texas, June (Schaeffer); type in Museum Brooklyn Institute, cotype in collection Banks.

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Chrysopa luctuosa n. sp.

Green, heavily marked with black; antennæ, including the second joint, wholly pale yellowish; face with a large shining black interantennal mark, spreading out below to the eyes, and above in a V-mark on the vertex; a black streak under each eye. Pronotum very short and broad, sides parallel, rounded in front, a broad submedian black stripe each side continued back on anterior part of the mesothorax; a transverse mark on the mesopleura, and a spot and angular mark below on the metapleura, black; abdomen dark green, marked with black each side. Wings with nearly all veins black, the subcosta, the median and the cubitus for one-fourth the way out are black, the radius wholly green; the radial sector black, the costals, gradates, anal veins, divisory veinlet, branches of radial sector, and marginal forks black, the gradates margined with brown, the stigma distinct and long. Wings moderately broad, hardly acute at tips, second cubital much shorter than the third, the divisory veinlet ending beyond the cross-vein, inner gradate series (of four veinlets) nearer to the outer series than to the radial sector.

Expanse 24 mill.

From Ft. Wingate, New Mexico, 26 June (Woodgate collection); goes in the group of *schwarzi*.

Chrysopa gravida n. sp.

Yellowish (greenish in life?); antennæ wholly pale, a large shining black interantennal mark spread out below to reach the eyes and above, the sockets are margined to the eyes; no marks on cheeks nor vertex; palpi marked with dark. Pronotum broad and rather long, and very much narrowed in front, with very broad, dark brown stripe on each side from margin nearly one-half way to middle. A brown dot on lateral lobes of meso- and metathorax. Abdomen and legs pale, wings with pale venation, but most of the cross-veins, base of median to beyond third cell, base of radial sector and the anals brownish; stigma indistinct; hind wings less heavily marked. Wings large and broad, tip rounded, second cubital cell as long as the third, latter wider at tip, divisory veinlet ends much beyond the cross-vein; inner gradate series (eight in number) much nearer the outer than to the radial sector; in hind wings the radial sector and median united only for a short distance.

Expanse 36 mm.

From Yosemite, California; a large and heavy species related to *Ch. robusta* of North Carolina, but the interantennal mark distinguishes it from that species.

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Chrysopa nanina n. sp.

Yellowish (probably greenish in life); a black mark each side on clypeus, an oblique blackish line under each antenna, uniting in the middle, a black line above antennal sockets from eye to eye, and angulate in the middle; palpi marked with black; antennæ pale on joints one and two, then black for about one-third the way to tip, thence pale. Pronotum with a broad blackish streak on each side reaching to margin, the mesonotum with two dark spots each side in front; abdomen and legs pale. Wings hyaline, the costa and median vein black at base, and the anal and its branches almost entirely black; the cubitus is rather darker on base than elsewhere; many of the cross-veins wholly black, branches of radial sector black, stigma distinct. Pronotum broader than long, much narrowed in front. Wings very long, hardly acute at tips; second cubital cell very slender, third barely widened at tip, the divisory veinlet ending much beyond the cross-vein, about ten or eleven gradates in outer series, about six in inner series, the inner series much nearer to the outer series than to the radial sector.

Expanse 37 mm.

From Palmerlee, Arizona (Biederman).

Our species of *Chrysopa*, with the longitudinal veins partly black at base, may be separated as follows; all have the antennal sockets margined above and below with black:

1. Pronotum broadly margined with black 2
   Pronotum with two black stripes, remote from the margin; subcosta black at base ..... **luctuosa.**
2. Basal part of antennæ beyond the second joint black; subcosta not black ..... **nanina.**
   Antennæ pale ..... 3.
3. Subcosta black; a black mark on each cheek ..... **schwarzi.**
   Subcosta not dark, median, costa and anal only dark; no mark on cheeks ..... **gravida.**

CHRYSOPIELLA n. gen.

Differs from *Chrysopa* in having but one series of gradate veins in either wing, this is the outer series; the median cells are consequently very long and curved. The radius beyond the end of the subcosta is connected to the costal margin by about four veinlets, the divisory cell is similar to that of *Chrysopa;* the antennæ are close together at base. The two species are greenish; not brownish as in *Eremochrysa*, which has only one series of gradate veinlets in the hind wings.

Type.—Ch. sabulosa Bks.

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Chrysopiella pallida n. sp.

Pale yellowish (greenish in life?); second joint of the antennæ black, first joint with a black line on the outer side; a median triangular spot below antennæ, an angular mark under each eye, a pair of elongate spots on vertex, and the upper antennal sockets narrowly dark brown; palpi marked with brown; pronotum unmarked, plainly a little narrower in front, rest of thorax unmarked; legs pale; abdomen pale, apex of male abdomen with a tuft of black bristles above, two submedian tufts below the middle and a middle point tipped with reddish. Wings hyaline, veins pale, unmarked, stigma distinctly yellowish, and near tip of wings, veins with black bristles. Both wings narrow, elongate, tips hardly acute, second cubital cell very narrow, no longer than the third, latter widened at tip, the divisory veinlet ends much beyond the cross-vein, the outer gradate series is near margin, about half of marginal veins forked.

Expanse 21 mm.

From Rincon, New Mexico, 31 August (Cockerell).

HEMEROBIIDÆ.

Our species of *Sympherobius* may be distinguished as follows:

1. Longitudinal veins of wing wholly dark ..... 2.
   Longitudinal veins of wings not all dark ..... 3.
2. Cells with two dark streaks ..... **occidentalis.**
   Cells all dark ..... **umbratus.**
3. Longitudinal veins with minute dark dots ..... 6.
   Longitudinal veins with dark streaks; face pale ..... 4.
4. Fore wings with two curved dark bands over the gradate series. **bifasciatus.**
   No such bands ..... 5.
5. Wing surface dark, margin mostly dark ..... **angustus.**
   Wing surface pale, margin with alternate dark and light spots. **californicus.**
6. Wings very broad at costal base; first radial sector usually connected to second by a cross-vein, a large dark spot on fore wing near hind margin toward base ..... **amiculus.**
   Wings much narrower on the costal base, rarely any cross-vein between first radial sector and the second ..... 7.
7. Three broad dark bands on fore wings ..... **pictus.**
   No such broad bands on wings ..... 8.
8. The dark dots on the veins occupy as much space as the pale, surface of wing mostly dark ..... **arizonicus.**
   The dark dots occupy much less space than the pale ..... 9.

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9. Wings very narrow; with scattered larger spots at forkings of veins. **sparsus.**
   Wings without such spots.....10.
10. Wing very narrow on costal base, no dark mark over inner gradate series.....**perparvus.**
   Wing broader on costal base, a large dark mark over end of inner gradate series.....**barberi.**

Sympherobius californicus n. sp.

Head yellowish, two brown stripes under each eye to mouth, a brown spot between antennæ, a curved brown line on vertex, its ends reaching forward to the sides of the eyes; antennæ pale on basal joints, blackish beyond, then pale, but dark near tip, ; pronotum with dark brown mark on each side. Wings whitish gray, with many dark spots, often including one or two pale dots, few marks on costal area, except it is dark brown near stigma; the venation pale, with short brown streaks, the veinlets connecting first and second radial sectors back to the radius, both gradate series and the lower branch of the cubitus all heavily dark brown, hind margin with alternate dark and whitish spots. Wings rather slender, the two radial sectors not connected, except at outer gradate series; each gradate series with the veinlets rather close to one another.

Expanse 12 mm.

From Los Angeles, Claremont, and Pasadena, California.

Sympherobius sparsus n. sp.

Pale reddish brown; face pale; antennæ dark near base, head very high on vertex, almost bilobed. Wings long, slender, pale, venation with minute dark dots, small brown spots over the gradates and on forks of veins, margin of wings with minute dark dots like those on veins. The four of inner gradate series are each widely separated from the next, so that they form a very oblique series; the outer four gradate veinlets not so widely separated, but the one between the radial sectors is much more basad than the others; two long medial sectors, each soon forked, not connected together, except at outer gradate series.

Expanse 8 mm.

From Kansas (Douglas County?) (Snow).

Sympherobius arizonicus n. sp.

Dark, shining brown; antennæ blackish on base, face with broad pale band just below the antennæ. Wings dark brown, densely irrorate with small irregular hyaline spots and streaks, but apparently a uniform dark brown all over; venation with many dark dots, close together; posterior and outer margins with alternate pale and dark spots. Wings not very long, but not near as broad as in *S. amiculus;*

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the two radial sectors not connected; the four outer gradates rather well separated, the one between the radial sectors more basad than the others, the inner four gradates not far apart, the hindmost is beyond the next above it; hind wings faintly brownish, with dark dots around the margin.

Expanse 10 mm.

From Prescott, Arizona (Oslar).

Sympherobius bifasciatus n. sp.

Head pale, a dark brown stripe under each eye, a spot between antennæ, a brown spot just above antennæ and a broken one behind on vertex, leaving a pale transverse band between them; pronotum dark brown, with a median yellowish stripe. Wings hyaline, with a curved brown band over each gradate series, and also the basal part of cubitus; venation pale, with rather long dark brown streaks; hind margin of wing pale, with dark spots. Wings rather slender, the two radial sectors not connected, except at outer gradate series, these not much separated from each other, the four in inner gradate series make a curved line, but not widely separated.

Expanse 9 mm.

From Colorado (Baker), No. 1027.

MANTISPIDÆ.

Mantispa cincticornis n. sp.

Head pale; a broad, brown, vertical stripe from mouth up between antennæ, broader than in *N. sayi;* antennæ yellow on basal fourth, then black, then yellow for several joints and the tip blackish. Anterior part of pronotum dark; thorax and abdomen reddish brown, latter marked with black; legs pale, femora dark at tip. Wings with long, narrow brownish stigma, and a small dark apical spot, the fore pair fuscous at base.

In general structure similar to *N. interrupta*, but separated by banded antennæ.

Expanse 22 mm.

From near Brownsville, Texas (Snow).

Mantispa fuscicornis n. sp.

A brown spot in middle of the clypeus, on the sides and across base of the clypeus, and at base of antennæ; also dark above antennæ; basal joints of antennæ yellowish, beyond the second joint dark brown or blackish, vertex with brown spot each side near eye; pronotum pale, front edge dark, with anterior sides dark and a short, dark

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median line. Base of fore wings fuscous, a long reddish stigma, but no apical spot; legs yellowish. In general structure similar to *M. sayi*.

Expanse 22–34 mm.

From Lake Worth and Kissimmee, Florida, the former from Mrs. A. T. Slosson.

Mantispa brunnea, var. **occidentis** n. var.

Similar to *M. brunnea*, but the wings are much less marked with brown; there is a distinct black band at base of the antennæ; a black band on vertex; a black band on front of the pronotum, and behind the anterior fourth it is wholly dark; meso- and metascutelli yellow, the femora are blackish.

From Wawawai, Washington (Mann): Ormsby County, Nevada (Baker), and Chimney Gulch, Golden, Colorado (Oslar).

MYRMELEONIDÆ.

Brachynemurus pulchellus n. sp.

Head pale; a large black interantennal mark, leaving a small pale spot each side above the antennæ; a transverse black line on the vertex, enlarged in the middle to inclose a small dot, and a dull black mark each side behind; antennæ pale, annulate with black, basal joint wholly whitish; palpi tipped with black; pronotum black, with a pale median stripe, broadest in front, and nearly interrupted in middle, a spot each side in front, and a stripe each side behind, widest behind; thorax dark, lined with pale, metanotum with a broad pale stripe each side, the scutellum with two pale dots, a few black bristles and long white hairs on the thorax; legs pale, dotted with black, forming bands at apex of femora, middle and tip of tibiæ, and tips of tarsal joints, all with long white hairs, and shorter black bristles: abdomen black; segments near tip marked with pale in middle. Wings hyaline, venation black and white, many cross-veins margined with fuscous, others snow-white, stigma black, gradate series margined with dark; hind wings scarcely marked, but the venation black and white. Wings rather narrow, fore pair scarcely acute at tips, hind pair very plainly so, three cross-veins before radial sector in fore wings, two in hind wings, about seven branches of the radial sector, four or five cross-veins between anal vein and cubital fork in fore wings.

Expanse 30 mm.

From Brown, California, 10 October (Grinnell). Differs from *B. barberi* in pale femora, in marked metanotum, and in spot each side on pronotum; the head and thorax are differently marked from *B. pusillus*.

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Brachynemurus carolinus n. sp.

Head pale, a narrow black band across face, a line up from it between the antennæ; a brown mark under each antenna, and one on basal and one on the second joint, rest of antennæ annulate with pale brown; front mostly black; vertex with a dark line on the front edge, extended back a little on each side of middle; pronotum grayish yellow, with three black lines, the median one forked in front, the lower edge black in the middle, all these lines rather indistinct, rest of thorax lined with black, a double line above fore wings, united behind, a median line, extending over the scutelli, which are also marked on the sides, and a submedian line each side. Abdomen brown, with a pale streak on each upper side, leaving a brown line on the crest; legs pale, femora with many dots, a mark on middle and one at tip of tibiæ, the fourth tarsal joint and the tip of the fifth black; spurs rather longer than two tarsal joints. Wings hyaline, venation interruptedly black and white, with small black spots along the upper side of cubitus, larger near tip, and the last one oblique and extending upward toward the tip of wing; also a spot near end of the anal vein; many other smaller spots on the forkings of veins, especially on the posterior and outer portion; many of the costal cross-veins white in middle; stigma pale, with basal dark spot. Hind wings without spots, but the venation marked. Wings not very long, acute at tip; three cross-veins before radial sector in fore wings, two in hind wings, about eleven branches of radial sector in each wing. Pronotum longer than broad; the abdomen of female barely longer than the wings.

Expanse 38–48 mm.

From Southern Pines, North Carolina, 8, 11, 20 June (Manee).

PANORPIDÆ.

Panorpodes carolinensis Bks.

Only the males of this, as well as of *P. oregonensis*, have been described. The females are very short winged and unable to fly, but hop about very lively when one attempts to capture them.

Panorpa longipennis n. sp.

The female in general is similar to *P. nebulosa*, but with plainly larger and longer wings, and there are five cross-veins in the apex of each fore wing; there is a large basal spot, larger than in *P. nebulosa*, two larger spots beyond, a narrow, irregular, pterostigmal band, the anterior margin of which does not reach the costal edge, an anal spot, and small spots in the apical part of wing that are somewhat connected together, and form irregular apical and preapical bands.

Expanse 35 mm.

From Black Mountain, north fork of the Swannanoa River, North Carolina, latter part of May.

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Bittacus arizonicus n. sp.

Closely related to *B. occidentis*, of same color, thickened femora, etc. But the male genitalia are more scabrous at tip, the superior pieces are more pointed, and narrower at tip and the inferior median piece has an apical tooth that can be seen in side view. The size is the same.

From Palmerlee, Arizona, August.

TRICHOPTERA.

LIMNEPHILIDÆ.

Stenophylax calypso n. sp.

Head yellow; basal joint of the antennæ yellowish, beyond brownish, rather strongly serrate beneath; ocelli large; anterior warts small, posterior warts narrow, transverse, nearly twice their length apart, these, the pronotum, and parts of mesonotum with black bristles. Thorax yellowish, darker above base of the fore wings; abdomen yellowish brown, darker at tip; legs pale yellowish, the tarsi and tibiæ rather reddish yellow, all with black spines; preapical spurs short, nearly twice their length before the apex; last joint of hind tarsi without spines beneath. Wings pale brownish, with many (perhaps 100) rather large, hyaline spots, much larger than in *Allophylax punctatissimus*, and they do not run together much, the costal area pale, without spots. The fore wings are broad, the outer margin rounded, but rather indented at ends of the veins; the discal cell is about twice as long as its pedicel, fork 1 extending its entire width back on the discal cell; the cubitus at the arculus is much farther from the branch of the median than in *Allophylax punctatissimus*, all the apical cells are broad at base. In the hind wings the apical cells are also broad at base, the third broader than the fourth.

Expanse 28 to 32 mm.

From the Catskills, New York, June, and Long Island, New York, May.

RHYACOPHILIDÆ.

Rhyacophila grandis n. sp.

Belongs to section in which fork 2 extends farther basally than fork 1. Antennæ pale, scarcely annulate with brown, basal joint also pale; palpi pale, last joints rather darker; head pale, with long yellowish hair, vertex darker, hairs on warts golden, ocellar warts hardly one-half diameter apart; thorax yellowish above, lateral lobes brown; abdomen black, tip paler, with the extreme tips of genitalia black; legs pale yellow, spurs darker, in female the front and middle tibiæ show a black spot above just before the preapical spur, this spur on front tibiæ is

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twice as long as width of joint. Wings dark, with many small yellowish white spots, especially numerous in apical half, larger semi-circular ones on margin between ends of the veins, a large circular one with geminate dark dot in the base of the second fork, an elongate spot on the stigma, several in the costal area; hind wings smoky, darker near tip, and there indistinctly maculate with pale, the radius black, other veins brown. Fore wings rather broad, outer margin slightly rounded; fork 2 plainly much before 1, fork 3 longer than pedicel beyond the cross-vein, fork 5 is broader near middle than at tip, and fork 4 widens but little at the tip.

Expanse 30 mm.

From Vernon; British Columbia, and Bon Accord, British Columbia, 14 June (Russell).

Rhyacophila atrata n. sp.

Belongs to section in which fork 2 extends farther basally than fork 1. Deep black, head and thorax rather shining, abdomen dull black; ocellar warts fully two diameters apart; legs yellowish, tarsi darker, spurs black, preapical one on front tibiæ but little longer than the width of the joint. Wings black, stigma very dark, a snow-white spot over veinlet connecting the medius and cubitus, no other pale spots; fore wings quite short and broad, outer margin rounded, fork 3 fully as long as the pedicel beyond cross-vein, fork 4 wide at tip, fork 5 with parallel sides for most of the distance; hind wings black, but not so intense as the front pair.

Expanse 12 mm.

From Black Mountain, north fork of the Swannanoa River, North Carolina, May. The smallest species so far described from the United States.

Rhyacophila luctuosa n. sp.

Belongs to section in which fork 2 extends farther basally than fork 1. Head, palpi and antennæ deep black, head with much golden hair, ocellar warts more than two diameters apart; thorax black, with golden hair in front; abdomen dull black, paler beneath, and genitalia pale; legs pale on femora, dark on tibiæ and tarsi, spurs dark, the preapical one on first tibia nearly twice as long as width of the joint. Wings blackish, veins black, stigma also black, heavily spotted with yellow in the cells, a larger spot on the stigma, no large spot on anal margin; wings long, but outer margin rounded, fork 3 shorter than the pedicel beyond cross-vein, fork 5 with nearly parallel sides; hind wings dusky, black near tips.

Expanse 20 mm.

From Woodworth Lake, Fulton County, New York, 23

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June (Alexander), and one (not fully colored) from Dane County, Wisconsin (Vorhies). This species is darker and more maculate than *R. torva*.

Rhyacophila basalis n. sp.

Belongs to section with fork 1 extending further basally than fork 2. Antennæ pale, faintly annulate with brown, basal joint nearly black; palpi dark; head black, some white hairs on the face, ocellar warts nearly their diameter apart, two smooth submedian ridges behind; thorax brown; legs pale yellow, spurs darker, tarsi scarcely darker toward tip, tibia 1 unmarked, preapical spur nearly twice as long as the width of joint. Wings rather uniformly smoky, the stigma long, very much darker; fore wings long and slender, fork 3 shorter than pedicel beyond cross-vein, outer apical margin straight; abdomen blackish above, the genitalia pale.

Expanse 20 mm.

From Claremont, California (Baker).

Rhyacophila angelita n. sp.

Belongs to section in which fork 2 extends farther basally than fork 1. Pale yellowish throughout, the dorsum of abdomen darker toward tip, palpi and antennæ pale, the latter slightly marked with brown, the head with pale yellowish hair, the ocellar warts scarcely one-half diameter apart; legs very pale yellow, tarsi hardly darker, spurs brown, preapical one on front tibiæ not twice the width of joint. Wings pale, stigma brownish, and some faint brown spots at ends of veins, and over some cross-veins; fore wings moderately long and broad, the outer margin much rounded, fork 3 shorter than pedicel beyond cross-vein, fork 4 wide open at tip, and longer than 3; fork 5 rather narrower at tip than in the middle; hind wings pale.

Expanse 20.

From Pasadena, Los Angeles County, California, 1 May (F. Grinnell).

Rhyacophila brunnea n. sp.

Belongs to section in which fork 2 extends farther basally than fork 1. Palpi pale on basal part, dark at tip; antennæ pale, annulate with brown, basal joint brownish; head brown, with mostly black hair, ocellar warts fully their diameter apart, thorax pale brown, with black hair. Abdomen dark brown; legs pale yellow, the tarsi and spurs brown, preapical spur of front tibiæ only little more than width of the joint. Wings brown, nearly uniform, and scarcely marked, the long, dark stigma with a pale yellow spot and three smaller pale spots in the space behind it, one in base of fork 2, and faint yellowish spots between ends of the veins on outer and apical margins; hind wings

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pale brownish. Fore wings long and narrow, outer margin nearly straight, fork 3 longer than pedicel beyond cross vein, fork 4 no longer than 3, fork 5 with sub-parallel sides.

Expanse 22 mm.

From Beulah, New Mexico, 10 July, 27 July (Cockerell).

Rhyacophila carolina n. sp.

Belongs to section in which the fork 2 extends farther basally than fork 1. Palpi brown; antennæ pale on basal half and annulate with brown, dark or nearly black on apical half, basal joint pale; head dark, mostly golden, but some black hair, ocellar warts nearly twice their diameter apart; thorax brown, black on the sides above the wings, with some golden hair; abdomen brown; legs pale, in male the basal part of tibia and basal joint of tarsus is dark above, the apical part of tibia very pale, in female legs are all pale yellow, spurs brown, preapical spur on front tibiæ nearly twice as long as width of joint. Wings rather short, broad in middle, outer margin rounded; dark brown to nearly black, much spotted with white on apical part, with larger spots along outer and apical margin between veins, and a large spot before middle of wing on the hind margin, a black band across apical cells, black around stigma, and a few other black patches. Fork 3 about as long or longer than the pedicel beyond cross-vein, fork 4 wide at tip.

Expanse 20 mm.

From Black Mountain, north fork of the Swannanoa River, May, North Carolina.

Rhyacophila formosa n. sp.

Belongs to section in which the fork 2 extends farther basally than fork 1. Palpi black, antennæ with black basal joint, beyond pale, broadly annulate with deep black; head black, with black and some white hair, ocellar warts small, about twice their diameter apart; thorax black, with two faint white submedian streaks; abdomen black above, paler beneath; legs pale, front and mid-tibiæ with black spot before the preapical spur, and also at tip, the tarsi marked with dark, a narrow pale ring at the preapical spur, latter in the front tibia but little longer than width of the joint. Wings deep black, with innumerable small patches of yellow hair, many large white spots, one in base of fork 2, several along the apical and outer margin between veins, but two spaces at tip, and one near anal angle unspotted, numerous small spots near anal angle and in the stigmal region; fore wings long and narrow, outer margin nearly straight, slightly incurved at fork 4, fork 3 longer than pedicel, beyond cross-vein, fork 4 scarcely as long as fork 3, fork 5 with parallel sides.

Expanse 22 mm.

From Delaware Water Gap, New Jersey (Slosson).

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Rhyacophila mainensis n. sp.

Belongs to section in which the fork 1 extends as far or farther basally than fork 2. Palpi pale; antennæ pale, basal joint pale; head dark, with yellowish hair, ocellar warts very small, fully twice their diameter apart; thorax black, abdomen brown; legs pale, tarsi darker, spurs brown, preapical one of front tibiæ fully twice the width of joint. Wings long and slender, outer margin straight; uniform pale brownish, the stigma hardly darker, no prominent spots, and but little hair, fork 3 a little longer than the pedicel beyond the cross-vein, fork 4 long and narrow, fork 5 with subparallel sides, also long, fork 1 reaching a little farther basally than fork 2.

Expanse 20 mm.

From Moosehead, Maine, 18 July (Johnson).

Our species of *Rhyacophila* are separable as follows:

1. Fork 2 of fore wings extends farther basally than fork 1.....7.
   Fork 2 does not extend farther basally.....2.
2. Tarsus I marked with black and pale, preapical spur of front tibiæ scarcely longer than the width of joint, which is pale at that place.....**coloradensis.**
   Tarsus I not dark and pale.....3.
3. Preapical spur of front tibiæ hardly longer than width of joint; tibiæ unmarked, fork 3 shorter than pedicel.....**terminata.**
   Preapical spur plainly much longer than the width of joint.....4.
4. Fork 3 as long as pedicel.....5.
   Fork 3 shorter than pedicel, antennæ yellowish, basal joint dark, legs yellow and spurs dark.....**basalis.**
5. Spurs pale as legs.....**hyalinata.**
   Spurs darker than legs.....6.
6. Fore wings long and pointed, outer margin straight..**mainensis.**
   Fore wings shorter and broad, outer margin rounded....**pacifica.**
7. Antennæ black, except basal joint.....8.
   Antennæ pale, more or less annulate.....11.
8. Wings much marked, a yellowish spot on the stigma ...**luctuosa.**
   Wings less marked, no spot on stigma.....9
9. Wings deep black, no marks, basal joint of antennæ black, 6 mm. long.....**atrata.**
   Wings paler, somewhat spotted, about 10 mm. long.....10.
10. Wings brown, more or less marked, basal joint of antennæ dark. **torva.**
    Wings darker, barely marked, basal joint of antennæ yellowish. **nigrita.**
11. Large, over 25 mm. expanse, antennæ and head pale.....12.
    Smaller species.....13.
12. A curved series of connected pale spots in the middle of outer margin.....**fuscula.**
    No such series of spots.....**grandis.**

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13. Head dark, wings much maculate, male front tibiæ marked with dark ..... 14.
    Head pale, wings hardly maculate; male front tibia unmarked..15.
14. No unspotted spaces on margin of wing; less black.....**carolina.**
    Margin with some unspotted spaces, deep black.....**formosa.**
15. Wings shorter and rounded .....**angelita.**
    Wings long and nearly pointed.....**brunnea.**

Glossosoma nigrior n. sp.

Black; antennæ pale, darker at tip; palpi black; head and thorax with black and white hair, ocellar warts transverse, about one and one-half diameters apart; abdomen black; legs pale yellowish, spurs brown. Wings blackish, fringe black, stigma dark. Venter of male with two spines near tip; metatarsi of middle legs of female broad and flattened. Wings moderately long, fork of median vein as far back as the fork of radial sector, fork 4 wide at tip, much shorter than 3 or 5. Expanse 18 mm.

From Black Mountain, North Carolina, north fork of the Swannanoa River, May.

SERICOSTOMATIDÆ.

Brachycentrus occidentalis n. sp.

Two males from Bon Accord, British Columbia.

May 4th (Russell coll.) are very similar to *B. incanus;* the hair of maxillary palpi is mixed grey and black; the male appendages black and acute at tip, together forming a narrowly cleft plate (it is so in both specimens, and in a series of *B. incanus* they form an entire plate). The lobe of penultimate ventral segment is broader than in *B. incanus*, and blackish at tip.

Our species of *Brachycentras* may be separated as follows:

1. Femora yellowish.....2.
   Femora black.....3.
2. Wings of ♀ whitish; superior appendages of ♂ forming an entire plate .....**lutescens.**
   Wings of ♀ dark grey; superior appendages of ♂ forming an emarginate plate.....**similis.**
3. Superior appendages of ♂ forming an entire plate, penultimate ventral segment with a very narrow lobe.....**incanus.**
   Superior appendages of ♂ forming a cleft or emarginate plate.....4.
4. Superior appendages of ♂ forming a broadly emarginate plate; penultimate ventral segment not produced in a rounded lobe, only slightly angularly produced.....**nigrisoma.**
   Superior appendages of ♂ forming a narrowly cleft plate; penultimate ventral segment with a rather broad lobe. **occidentalis.**

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Schizopelex lobata n. sp.

Maxillary palpi whitish, very much enlarged, covering the face; antennæ dark brown; vertex with two elongate parallel black lobes reaching back to the thorax; body dark brown; genitalia yellowish; legs yellowish, the tibiæ rather darker; wings a uniform dark grey, venation black, fringe blackish. Venation is similar to *S. festiva*, but the subapical cells of fore wings reach back much farther than in that species, being fully their width before the small cell on margin of wings at the end of anal vein. The lateral pieces of the male genitalia are much more slender than in *S. festiva;* and the lobes of head are more elongate.

Expanse 23 mm.

From Woodworth Lake, Fulton County, New York, 22 June (Alexander), and Squam Lake, New Hampshire, 14 July (G. M. Allen).

THELIOPSYCHE n. gen.

Venation similar to *Micrasema*, but fork 3 of hind wings is present; spurs 1, 2, 4 in ♂, 1, 4, 4 in ♀. Antennæ wide apart at base, in ♂ the basal joint longer than width of head, in ♀ very much longer; maxillary palpi of ♂ upcurved, bristly, covering the face; four warts on vertex, small one each side in front, and a long transverse one each side behind. In the fore wings the discal cell is long and closed; but in the hind wings open.

Theliopsyche parva n. sp.

Blackish; antennæ black; labial palpi white; vertex and thorax with black bristles. Wings uniform blackish brown, with black hair, long on veins, fringe very long, dark; the arculus and cross-vein from the radial sector to median are whitish hyaline. Legs rather pale, the spurs short, hardly three times as long as width of tibiæ, the subapical pair of the hind tibiæ not twice their length before the apical pair. In the female the radial sector of hind wings forks twice at one place.

Expanse 8 to 9 mm.

From Woodworth's Lake, Fulton County, New York, 23 June (Alexander).

Notiopsyche carolina n. sp.

Pale yellowish throughout; antennæ with the apex of each joint above broadly marked with brown; basal joints mostly with grey hair, but not as dense as in *N. latipennis*. Wings with short, sparse, yellowish hair, and with scattered longer black hairs, especially on the veins, and along the margin, the apical fringe quite long, and the apical half of fore wings distinctly infuscated, and a blackish patch just beyond

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the discal cell. Basal joint of antennæ very slender, much longer than the width of the head, rest of antennæ rather serrate above, and hairy beneath; long erect grey hair on head and pronotum. Wings rather short and broad, the discal cell ends but little beyond middle of the wings, and is about as near to hind as to costal margin; the small cell in middle of hind margin is three times as long as broad.

Expanse 12 mm.

From Southern Pines, North Carolina, 23 April (Manee). Very similar to *N. latipennis* in general, but much smaller and longer, less hairy joints of antennæ.

Mormomyia unicolor n. sp.

Maxillary palpi short, directed forward, black haired; antennæ rather far apart at base, basal joints as long as head, black haired with some white intermixed, beyond rather heavy, but soon tapering, pale, narrowly annulate with black. Vertex and prothorax with long erect, brown hair, rest of thorax with mostly black, but some white hair. Legs pale yellowish, tibiæ darker, abdomen brown, paler at base below; wings uniform blackish grey, with many small yellow hairs, and longer black hairs, latter more abundant on the veins, venation yellowish; apical fringe very short. Wings a little broader than in *M. vernalis*, but the venation very similar; the third subapical cell does not extend back of the base of the second subapical cell.

Expanse 20 mm.

From Switzer's Camp, San Gabriel Mountains, California, June (Grinnell coll.).

PHANOPSYCHE n. gen.

Sericostomatid, subfamily Lepidostomatinæ.

Discoidal cell closed in both wings; spurs 2–4–4; palpi recurved, and tipped with dense brush of long black hair; basal joint of antennæ rather wide apart at base, moderately long; in the hind wings there is a closed cell formed by the union of fork 2, as in *Paraphlegopteryx*, but the venation is otherwise quite different; the fork 1 is not stalked.

Phanopsyche grisea n. sp.

Palpi densely long black haired; basal joint of antennæ brown, with dark hair, rest of antennæ yellowish, barely annulate above; legs pale, the tarsi rather darker, the subapical pair of spurs not twice their length from the apical pair; thorax brownish in the middle, yellowish near base of the wings; abdomen brown above, paler beneath; wings pale uniform grey, venation yellowish brown. Wings rather broad, fore-pair with broad costal area, the subcosta and radius rather undulate, fork 1 reaching back to the discal cell; in the hind wings there is a slender closed cell, formed by union of fork 2; several of the

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veins are much curved. The antennæ are rather short, with short bristles at tips of the joints. The male genitalia show a pair of parallel appendages beneath, and above a rounded bristly piece each side, and above this a heavy tuft of long hair.

Expanse 16 mm.

From Woodworth's Lake, Fulton County, New York, 22 August and 14 September (Alexander coll.).

HYDROPSYCHIDÆ.

Wormaldia plutonis n. sp.

Black, and black haired; some white hairs over the mouth and extending up between antennæ and a narrow band of white hair across the front of vertex; anterior femora narrowed rather suddenly beyond the middle; subbasal spurs of middle tibiæ not nearly the length of longer spur from base of joint, on hind tibiæ the middle spurs are much nearer to tip than to base, about twice the length of the shorter spur from tip of joint; the uniform deep black wings have a short black fringe; the fore wings are rather slender, the third apical fork has a pedicel as long as the fork; the middle and hind tibiæ are white haired, rest of legs black.

Expanse 13 mm.

From Delaware Water Gap (Mrs. A. T. Slosson), and Johnstown, New York, 28 June (Alexander).

Wormaldia femoralis n. sp.

Black, and black haired; white hair over the mouth, some short white hair on vertex, not such long tufts of black hair as in *W. plutonis;* legs mostly pale yellow, coxæ and bases of femora, the spurs and tarsi black; the sub-basal spurs of middle tibiæ are the length of the longer one from the base of joint, the middle pair of hind tibiæ are as in *W. plutonis*. Wings black, but not as jet black as in *W. plutonis*, with black fringe; third apical fork is not quite as long as its pedicel.

Expanse 12 mm.

From Sport Island, Sacandaga River, Fulton County, New York, 27 June (Alexander coll.). Readily separated from *W. plutonis* by the pale femora.

Diplectrona nigripennis n. sp.

Black, with black hair; rufous hair over the front of head, and some on the back; prothorax with long rufous hairs, and large tufts of rufous hair at base of the wings; tip of abdomen yellowish; legs yellowish, femora rather darker. Wings uniform dull black, in apical part of fore wing some very faint pale spots in the middle of some cells, and a hyaline spot at arculus; hind wings darker on costal area and near the stigma than elsewhere; fork 3 of fore wings twice as long as its

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pedicel. Antennæ strongly crenulate, the joints not near as long as in *D. modesta*.

Expanse 20 mm.

From Mt. Tamalpais, Marin County, California, 24 Febuary (F. Grinnell).

Polycentropus remotus n. sp.

Head with yellowish white hair above and between the antennæ, vertex with black hair, tufts of pale at base of wings; palpi brown; antennæ pale, annulate with brown; abdomen brown above, yellowish beneath; legs yellowish, tarsi and anterior tibiæ rather darker. Wings brown, heavily maculate with pale yellowish, a long pale streak on middle of costal area, apical half of stigma pale, pale spots on margin of wing between the ends of the veins, and many small yellowish patches elsewhere; thyridium and arculus hyaline white. Hind wings smoky, darker on tips, fringe brown. In fore wings fork 1 is scarcely as long as its pedicel, forks 3 and 4 do not reach back quite as far as fork 2; in hind wings fork 1 is also very short.

Expanse 15 mm.

From Peachland, British Columbia, 23 July (Wallis).

Nyctiophylax mœstus n. sp.

Head with dense pale yellowish hair; palpi brown, antennæ yellowish, annulate above with brown; some black hair above the eyes, on the pronotum, and at base of the wings; abdomen dark above; legs pale, the basal joint of tarsi barely darker above, the anterior tibiæ and tarsi darker in front. Wings blackish, nearly uniform, but rather darker at tips, in some lights faintly golden at tip; fringe black; a faint whitish spot at the arculus; hind wings smoky, darker at tip, fringe black. Forks 2, 3, 4 and 5 in fore wings, forks 3 and 4 rather short, discal cell longer than pedicel; in hind wings the cell is closed, forks 2 and 5 present, fork 2 from apex of the cell.

Expanse 11 mm.

From Peachland, British Columbia, 19 August (Wallis). Darker than our other species of the genus.

HYDROPTILIDÆ.

Orthotrichia pictipes n. sp.

Face densely black haired; basal third of antennæ heavy, densely jet black haired, beyond brown, each joint annulate with pale on base; antennæ not half as long as wings; palpi pale yellowish; vertex with grayish white hair; thorax mostly with gray hair, a black tuft each side at anterior base of mesothorax; femora of legs rather pale, tibiæ darker, mid and hind pairs distinctly fringed behind toward tip; spurs 0-3-4 mostly white, but black on extreme base; tarsi pale, very distinctly marked with brown on basal part of each joint above; abdomen dark. Wings slender, acute; deep black, in some lights rather

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tawny near middle, with three white spots near middle in a transverse row, nearly forming a line across wing, a white dot at base of stigma, three smaller beyond; and three on the posterior apical border, the fringe beyond the white stigmal dot is very long, dense, and black, a tuft of white fringe at extreme tip of wing; the posterior fringe jet black, and about as long as width of the wing; hind wings uniform blackish, with a long, deep black fringe; the front margin of hind wing is straight to the middle and then only barely excavate or rather incurved to the tip.

Expanse 7 mill.

From Johnstown, New York, 25 June, Hales Creek (Alexander coll.) and Poquonock, Conn., 22 May (Walden coll.).

On account of the short and basally thickened antennæ, it may form a new genus.

EXPLANATION OF PLATES.

FIG.

1. *Raphidia distincta*, apical part of fore wing.
2. *Raphidia minuta*, genitalia.
3. *Raphidia oblita*, genitalia
4. *Raphidia occulta*, genitalia.
5. *Raphidia assimilis*, genitalia.
6. *Raphidia distincta*, genitalia, and superior piece from above.
7. *Raphidia adnixa*, genitalia.
8. *Raphidia arizonica*, genitalia.
9. *Raphidia bicolor*, genitalia.
10. *Raphidia minuta*, apical part of fore wing.
11. *Bittacus arizonica*, genitalia from above.
12. *Bittacus arizonica*, genitalia, side.
13. *Chrysopa pleuralis*, pleura.
14. *Chrysopa furcata*, face.
15. *Sympherobius californicus*, genitalia.
16. *Theliopsyche parva*, wings, vertex, and genitalia.
17. *Phanopsyche grisea*, wings.
18. *Schizopelex lobata*, genitalia.
19. *Phanopsyche grisea*, head.
20. *Schizopelex lobata*, genitalia.
21. *Mormomyia unicolor*, genitalia.
22. *Phanopsyche grisea*, genitalia.
23. *Glossosoma nigrior*, genitalia.
24. *Rhyacophila luctuosa*, genitalia.
25. *Stenopsyche calypso*, genitalia.
26. *Rhyacophila basalis*, genitalia.
27. *Rhyacophila grandis*, genitalia.
28 *Notiopsyche carolina*, genitalia.
29. *Rhyacophila angelita*, genitalia.
30. *Isoperla bellona*, ventral plate.
31. *Rhyacophila carolina*, genitalia.
32. *Brachycentrus occidentalis*, genitalia from above.
33. *Diplectrona nigripennis*, above, and *D. modesta*, below—antennæ.
34. *Wormaldia plutonis*, genitalia.
35. *Perla slossonæ*, ventral plate.

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The Entomological Writings of John Hamilton, M. D.,* with an Index to the New Coleoptera Described and Named,† and an Account of the Disposition made of his Collection and Entomological Library.

BY EDWARD A. KLAGES.

In 1905 there was published, at the personal expense of its author, a very small edition of a paper entitled "Duplicates of Papers on Coleoptera, published mostly in the Canadian Entomologist," by John Hamilton, M. D. Its contents can be better understood from its three sub-titles, namely: "Index to Papers Published in the Canadian Entomologist, Entomological News and Entomologica Americana" by John Hamilton, M. D., Allegheny, Pa. "Index to Notes not in this Collection." "Index to Species." It was printed to accompany the fifteen more or less incomplete sets of his entomological writings that he possessed and was bound with them and distributed to a few libraries and friends. The number of *actual* entomological contributions listed in it, and which were wholly or in part by him, amounted to fifty-one, while the nearest complete "sets" contained but thirty-six papers other than the list itself. The paper is much in need of correction and, owing to his later writings, it is necessarily incomplete. It is moreover available to very few on account of the aforementioned very small edition.

For the reasons given above, and because of cherished recollections of my departed friend, Dr. Hamilton, the writer undertook the preparation of this paper which appears under an appropriate and comprehensive title. Mr. Charles W. Leng has, very kindly and definitely, advised me as to the new genus and species described in their (Leng and Hamilton's) valued synopsis of the Lamiinæ of North America,

* Dr. Hamilton was born Feb. 17, 1827, and died Feb. 12, 1897. An account and picture of him was published in Entomological News, April, 1897.

† The collection and study of beetles was his favorite pastime and, while part of his entomological writings was on other insects, he never undertook the description of new species outside of his chosen order.

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and much care has been taken to verify all the titles, names and bibliographical references, and to make the paper complete. It is therefore hoped that this work will prove of convenience and value to both the systematic and the economic entomologist.

CHRONOLOGICAL LIST OF PUBLISHED WRITINGS.

PAPERS WHOLLY BY. DR. HAMILTON.

Remarks on Agonoderus comma Fab., **pallipes** Fab., **nigricollis** Lec. and **Tachycellus** (*Bradycellus*) **atrimedius** Say.
Can. Ent. vol. xiv, pages 104–106, June, 1882.

Observations on Anthrenus varius Fab., **Anthrenus musæorum** Lin., **Trogoderma ornata** Say, and **Sitodrepa panicea** Lin.
Can. Ent., vol. xv, pages 90–93, May, 1883.

Notes on a Few Species of Coleoptera which are Confused in Many Collections, and on Some Introduced European Species.
Can. Ent., vol. xvi, pages 35–38, Feb., 1884.

Ceratocampa (*Citheronia*) **regalis** Fab.
Can. Ent., vol. xvi, pages 47–48, Mar., 1884.

The Survival of the Fittest Among Certain Species of Pterostichus as Deduced from their Habits.
Can. Ent., vol. xvi, pages 73–77, Apr., 1884.

On Valgus canaliculatus and squamiger; Elleschus bipunctatus, [and] Xyloryctes satyrus.
Can. Ent., vol. xvi, pages 105–108, June, 1884.

On Trogoderma ornata, Physonota unipunctata, and Tanysphyrus lemnæ.
Can. Ent., vol. xvi, pages 133–136, Aug., 1884.

Coleoptera in September on Brigantine Beach, N. J., on the Atlantic coast.
Can. Ent., vol. xvi, pages 186–190, Oct., 1884.

Hibernation of Coleoptera.
Can. Ent., vol. xvii, pages 35–38, Feb., 1885.

Short Notes on Coleoptera.
Can. Ent., vol. xvii, pages 45–48, Mar., 1885.

Remarks on Some Species of Coleoptera, with Supplementary Descriptions.
Can. Ent., vol. xvii, pages 103–106, June, 1885.

Entomology at Brigantine Beach, N. J., in September.
Can. Ent., vol. xvii, pages 201–206, Nov., 1885.

Natural History Notes on Certain Coleoptera,—No. I.
Can. Ent., vol. xviii, pages 26–30, Feb., 1886

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Natural History Notes on Coleoptera,—No. II.
Can. Ent., vol. xviii, pages 111–116, June, 1886.
[A correction to notes in the June number.]
Can. Ent., vol. xviii, page 140, July, 1886.
Natural History Notes on Coleoptera,—No. III.
Can. Ent., vol. xix, pages 62–65, Apr., 1887.
Synonomy in American Coleopterology.
Can. Ent., vol. xix, pages 105–108, June, 1887.
Elaphidion villosum Fab.
Can. Ent., vol. xix, pages 141–144, Aug., 1887.
Saperda Fayi, S. concolor, and Aphodius rufipes.
Can. Ent., vol. xx, pages 6–9, Jan., 1888.
Natural History Notes on Coleoptera,—No. IV.
Can. Ent., vol. xx, pages 61–67, Apr., 1888.
[A correction to notes in the April number.]
Can. Ent., vol. xx, page 120, June, 1888.
[Letter on an article in Entomologica Americana entitled "Thoroughness in Entomological Tables."]
Ent. Amer., vol. iv, page 78, July, 1888.
Catalogue of the Myrmophilous Coleoptera, with Bibliography and Notes.
Can. Ent., vol. xx, pages 161–166, Sept., 1888.
Knowledge of Death in Insects.
Can. Ent., vol. xx, pages 179–180, Sept., 1888.
Electric Light Captures.
Psyche, vol. v, pages 149–150, Jan., 1889.
Notes on Coleoptera,—No. V.
Can. Ent., vol. xxi, pages 29–34, Feb., 1889.
✓ **Catalogue of the Coleoptera Common to North America, Northern Asia and Europe, with the Distribution and Bibliography.**
Trans. Amer. Ent. Soc., vol. xvi, pages 88–162, Mar., 1889.
Corrections and Additions to Previous Papers.
Can. Ent., vol. xxi, pages 101–108, June, 1889.
Rare Beetles on the New Jersey Coast.
Ent. News, vol. i, pages 12–13, Jan., 1890.
Belaninus—Its Food Habits.
Can. Ent., vol. xxii, pages 1–8, Jan., 1890.
Proposed Corrections of Specific Names to Harmonize Mr. Henshaw's Catalogue of the North American Coleoptera, with the Generally Accepted European Nomenclature, with Relation to the Species Common to the Two Continents.
Ent. Amer., vol. vi, pages 41–44, Mar., 1890.
The Inhabitants of a Hickory-Nut Hull.
Ent. News, vol. i, pages 49–51, Apr., 1890.

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On the Probable Pollenization of Greenhouse Chrysanthemums by Eristalis tenax.
Ent. News, vol. vi, pages 81–83, May, 1890.
[Notes relating to Mr. Leng's synopsis of the genus *Leptura*, published in the October number of Entomologica Americana.]
Ent. Amer., vol. vi, pages 214–215, Nov., 1890.

Entomology at Longport, N. J.
Ent. News, vol. i, pages 142–144, Nov., 1890.

Notes on Coleoptera,—No. VI.
Can. Ent., vol. xxii, pages 237–242, Nov., 1890.

Notes on Coleoptera,—No. VII.
Can. Ent., vol. xxiii, pages 60–65, Mar., 1891.

Notes on Sphenophorus minimus Hart.
Ent. News, vol. ii, pages 113–114, June, 1891.

Lachnosterna insperata and fraterna.
Ent. News, vol. ii, pages 135–137, Sept., 1891.

Notes on Coleoptera,—No. VIII.
Can. Ent., vol. xxiii, pages 181–186, Sept., 1891.

Comments on the Fifth Report of the U. S. Entomological Commission.
Insect Life, vol. iv, pages 129–132, Nov., 1891.

Notes on Coleoptera,—No. IX.
Can. Ent., vol. xxiv, pages 37–42, Feb., 1892.

Notes on Coleoptera,—No. X.
Can. Ent., vol. xxiv, pages 157–163, July, 1892.

Notes on Bruchus alboscutellatus, Miarus hispidulus, Cœliodes acephalus, and a New Thi[n]obius.
Ent. News, vol. iii, pages 253–255, Dec., 1892.

Notes on Coleoptera,—No. XI.
Can. Ent., vol. xxiv, pages 293–300, Dec., 1892.

The Coleoptera of Alaska.
Ent. News, vol. iv, pages 187–188, June, 1893.

Medico-Entomology.
Ent. News, vol. iv, pages 217–219, Sept., 1893.

List of Coleoptera Taken at Sparrow Lake, Ont.
Can. Ent., vol. xxv, pages 272–279, Nov., and pages 324–327, Dec., 1893.

Descriptions of Some New Species of Coleoptera Occurring Near Allegheny, Heretofore Undescribed.
Can. Ent., vol. xxv, pages 305–310, Dec., 1893.

✓ **Catalogue of the Coleoptera of Alaska, with the Synonomy and Distribution.**
Trans. Amer. Ent. Soc., vol. xxi, pages 1–38, Jan., 1894.

Coleoptera Taken at Lake Worth, Florida.
Can. Ent., vol. xxvi, pages 250–256, Sept., 1894.

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Catalogue of the Coleoptera Common to North America, Northern Asia and Europe, with [The] Distribution and Bibliography.
Second Edition.
Trans. Amer. Ent. Soc., vol. xxi, pages 345–416, Oct., 1894.

Mononychus vulpeculus Fab., **and Its Parasites.**
Ent. News, vol. v, pages 287–288, Nov., 1894.

Catalogue of the Coleoptera of Southwestern Pennsylvania, with Notes and Descriptions.
Trans. Amer. Ent. Soc., vol. xxii, pages 317–381, Oct., 1895.

Coleoptera Taken at Lake Worth, Florida,—No. II.
Can. Ent., vol. xxvii, pages 317–322, Nov., 1895.

The Red Bug.
Ent. News, vol. vii, pages 2–3, Jan., 1896.

A Review of T. L. Casey's Reasons for Striking Certain Species of Coleoptera from the American-Asiatico-European Catalogue.
Ent. News, vol. vii, pages 70–71, Mar., 1896.

Lepyrus.
Can. Ent., vol. xxviii, pages 125–127, May, 1896.

Lepyrus alternans and capucinus, Lixus fossus, Cremastochilus Harrisii, and Polypleurus nitidus.
Can. Ent., vol. xxviii, pages 184–187, July, 1896.

Notes on Coleoptera,—No. II.
Can. Ent., vol. xxviii, pages 261–265, Oct., 1896.

Physocnemum violaceipenne n. s., Copris gopheri, Spalacopsis filum, and Ancylocera brevicornis.
Ent. News, vol. vii, pages 286–287, Nov., 1896.

Random Notes on Coleoptera.
Ent. News, vol. vii, pages 291–293, Dec., 1896.

Pinodytes Hamiltoni and Anthicus formicarius.
Ent. News, vol. viii, pages 34–35, Feb., 1897.

PAPERS IN PART BY DR. HAMILTON.

[A note by Dr. Geo. H. Horn in which he quotes an account of an abnormal form of *Cremastochilus canaliculatus* from a letter from Dr. Hamilton.]
Ent. Amer., vol. i, pages 187–188, Jan., 1886.

The New Catalogue of European Coleoptera.
By Samuel Henshaw and John Hamilton, M. D.
Psyche, vol. vi, pages 147–148, Sept., 1891.

A List of Some of the Catalogues and Local Lists of North American Coleoptera.
By John Hamilton and Samuel Henshaw.
—A–G.
Psyche, vol. vi, pages 160–162, Oct,, 1891.

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—H–P.
Psyche, vol. vi, pages 188–193, Dec., 1891.
—R–Z.
Psyche, vol. vi, pages 205–209, Jan., 1892.

Synopsis of the Cerambycidæ of North America, Part III, The Lamiinæ.
By Chas. W. Leng, B. S., and John Hamilton, M. D.
Trans. Amer. Ent. Soc., vol. xxiii, pages 101–178, Mar., 1896.

LIST OF NEW COLEOPTERA DESCRIBED,
WITH THE BIBLIOGRAPHY.

CARABIDÆ.

Bembidium postfasciatum,—Can. Ent., Dec., 1893.
Platynus parmarginatus,—Can. Ent., Dec., 1893.
Stenolophus humidus,—Can. Ent., Dec., 1893.

STAPHYLINIDÆ.

Myrmedonia Schmitti,—Trans. Amer. Ent. Soc., Oct., 1895.
Homalium flavidum,—Trans. Amer. Ent. Soc., Oct., 1895.

CRYPTOPHAGIDÆ.

Atomaria humeralis,—Trans. Amer. Ent. Soc., Oct., 1895.

NITIDULIDÆ.

Soronia substriata,—Can. Ent., Dec., 1893.

ELATERIDÆ.

Corymbites elongaticollis,—Can. Ent., Dec., 1893.

PTINIDÆ.

Hemiptychus castaneus,—Can. Ent., Dec., 1893.

CERAMBYCIDÆ.

Physocnemum violaceipenne,—Ent. News, Nov., 1896.
Liopus alpha Say var. *floridanus*,—Trans. Amer. Ent. Soc., Mar., 1896.
minuens,—Trans. Amer. Ent. Soc., Mar., 1896.
Schwarzi,—Trans. Amer. Ent. Soc., Mar., 1896.
foveatocollis,—Trans. Amer. Ent. Soc., Mar., 1896.
Lepturges megalops,—Trans. Amer. Ent. Soc., Mar., 1896.
Ecyrus fasciatus,—Trans. Amer. Ent. Soc., Mar., 1896.
Oporataxia, new genus,—Trans. Amer. Ent. Soc., Mar., 1896.
lineata,—Trans. Amer. Ent. Soc., Mar., 1896.
Spalacopsis suturalis,—Trans. Amer. Ent. Soc., Mar., 1896.
Amphionycha amœna,—Trans. Amer. Ent. Soc., Mar., 1896.

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CISTELIDÆ..

Isomira ruficollis,—Can. Ent., Dec., 1893.

ANTHICIDÆ.

Xylophilus tuberculifer,—Can. Ent., Nov., 1893.

CURCULIONIDÆ.

Lepidophorus setiger,—Trans. Amer. Ent. Soc., Oct., 1895.
Acalles curtus,—Can. Ent., Dec., 1893.
Pachybaris strigapunctatus,—Can. Ent., Dec., 1893.
Belaninus confusor,—Can. Ent., Dec., 1893.

THE DISPOSAL OF THE COLLECTION AND ENTOMOLOGICAL LIBRARY.

Although the repository of Dr. Hamilton's collection and entomological library was announced a few years ago,* the nature of the preceding portion of this paper makes it fitting and advisable to include, as the title implies, an account of the facts of the matter.

In compliance with Dr. Hamilton's Last Will and Testament, dated the 17th day of February, 1893, his collection and entomological library have been permanently placed in the Carnegie Museum, Pittsburgh, Pa. In order to learn the exact conditions of the bequest conveying the same, recourse was made to the Will itself wherein is found the following: Item 10th. "I give and bequeath to Dr. J. W. Holland, Chancellor of the Western University, my entomological collection, and entomological library, in trust for Museum and natural history library, of the Carnegie Library Association of City of Pittsburgh, and also the cases in which said library is now contained, and also my manuscript catalogue of the Coleoptera of Allegheny, Pittsburgh, and vicinity, with hope that it may be eventually published."†

* In Entomological News, Dec., 1900, page 620, Mr. Geo. A. Ehrmann made reference to the whereabouts of the collection, and, in the Annals of the Carnegie Museum, Vol. I, page 266, there is a somewhat erroneous note on his collection, library and will.

† The trusteeship was necessary because the bequest was made before the Carnegie Museum was properly established, and the trustee's initials are transposed. The manuscript mentioned was later on published under Dr. Hamilton's own guidance and under the more suitable title listed herein.

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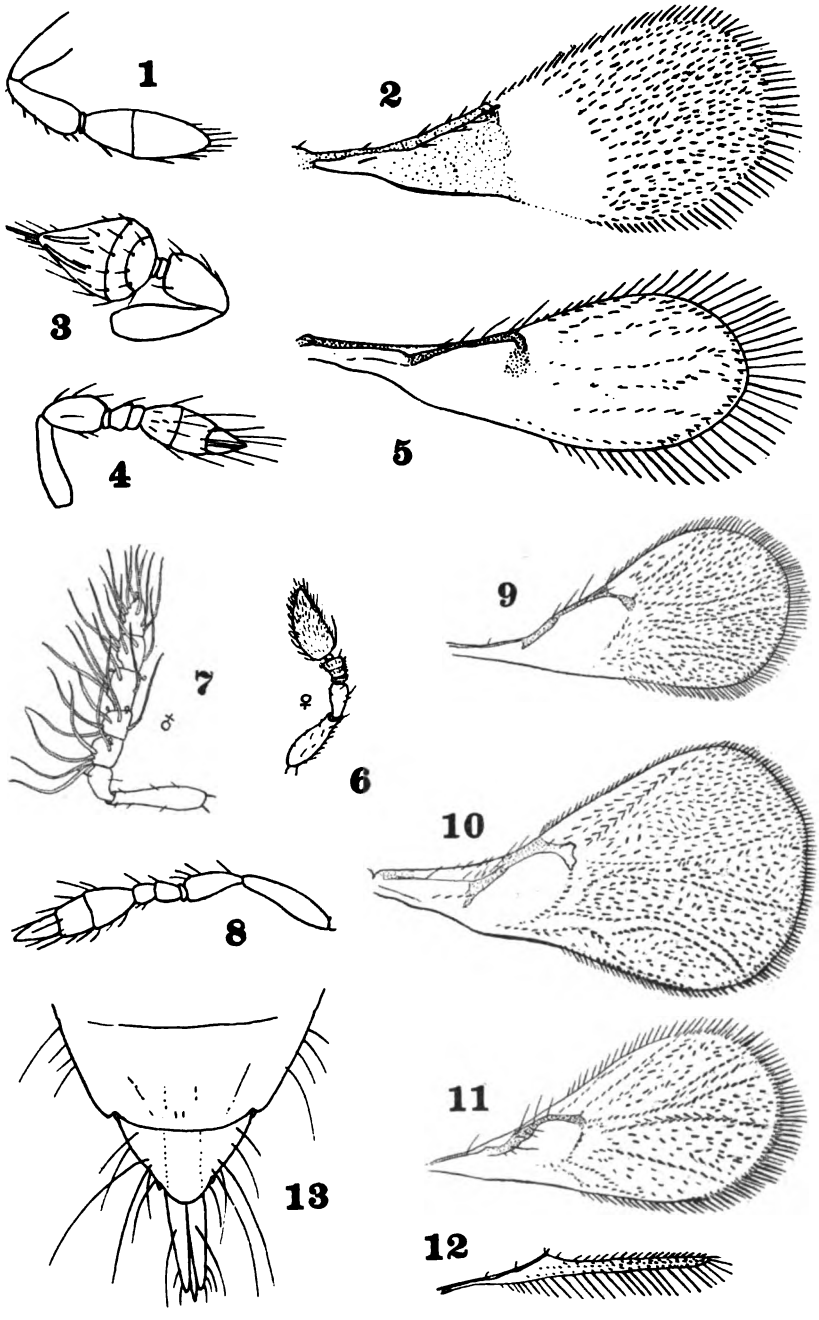

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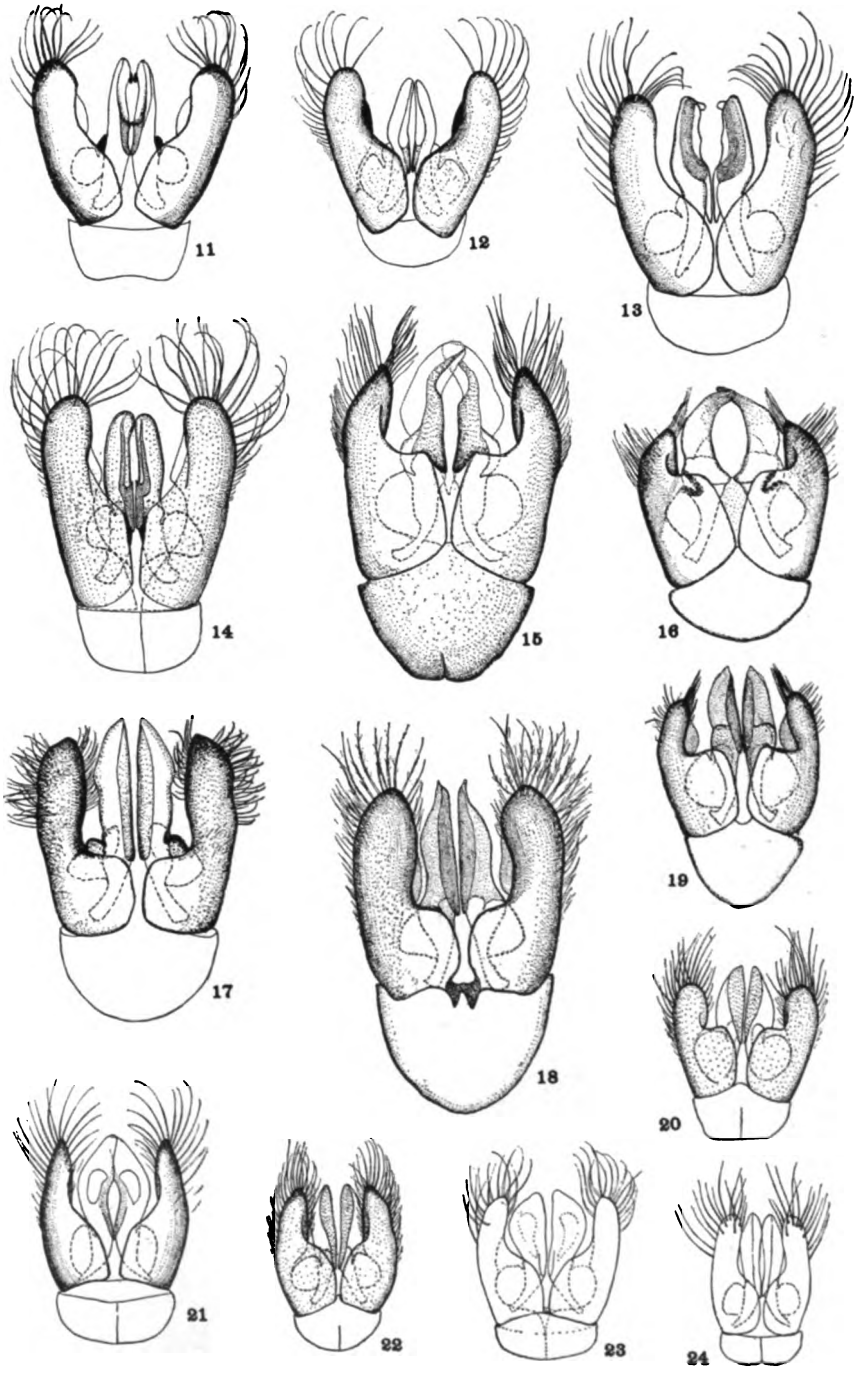

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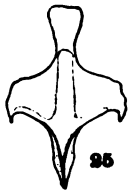
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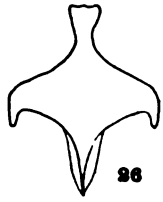
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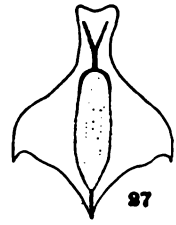
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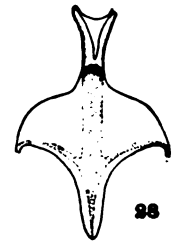
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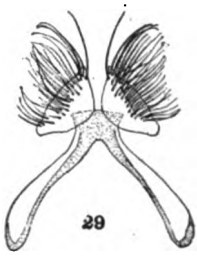
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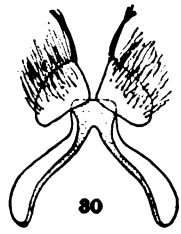
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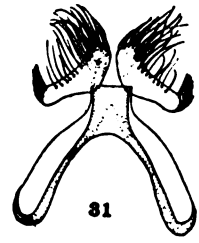
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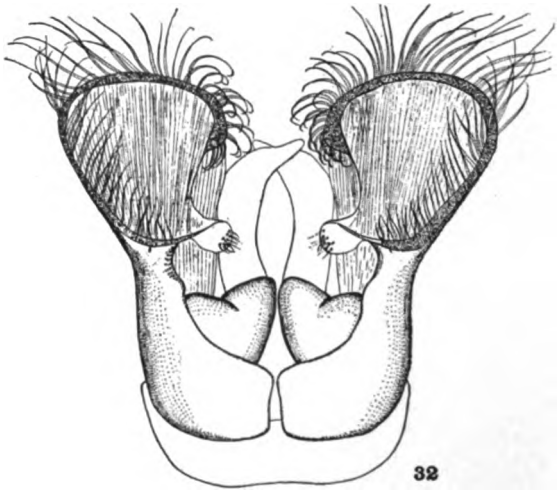
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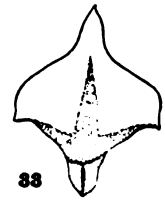
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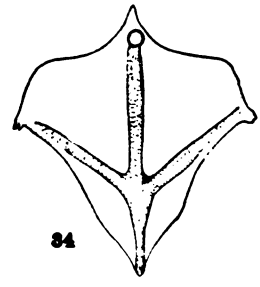
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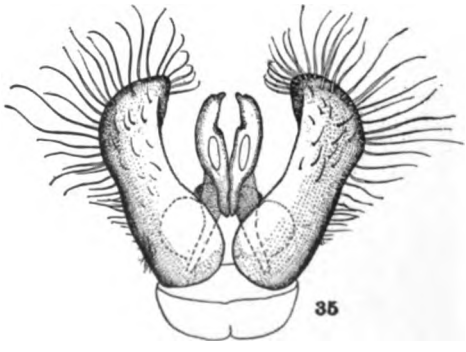
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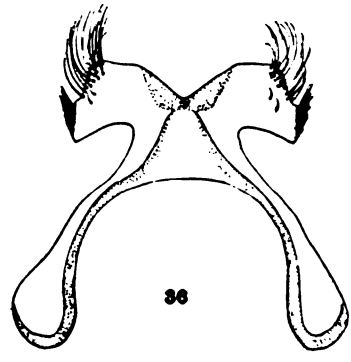
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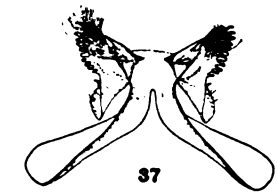
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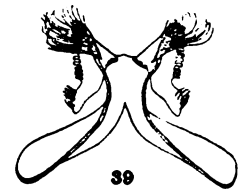
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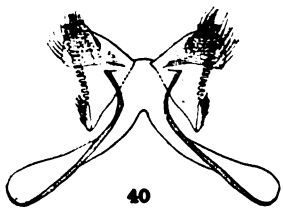
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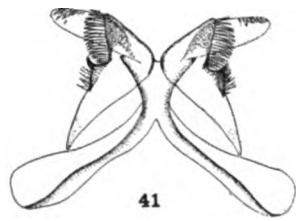
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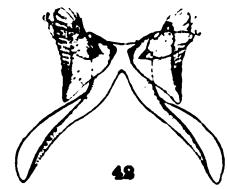
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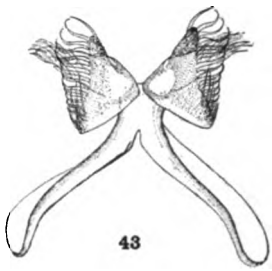
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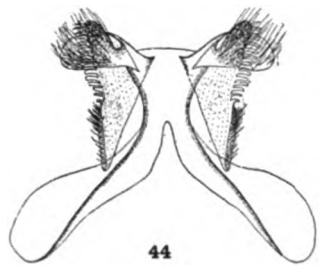
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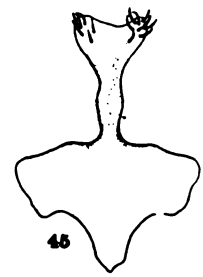
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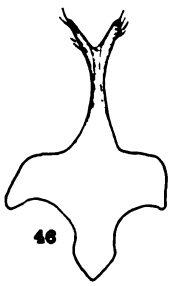
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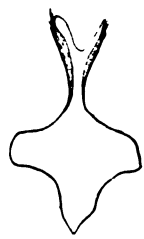
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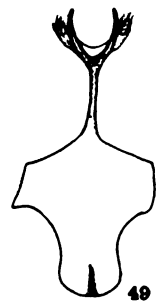
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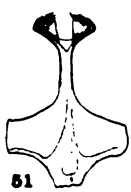
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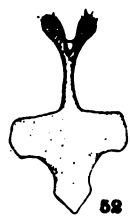
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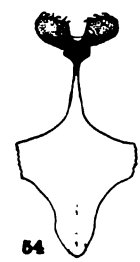
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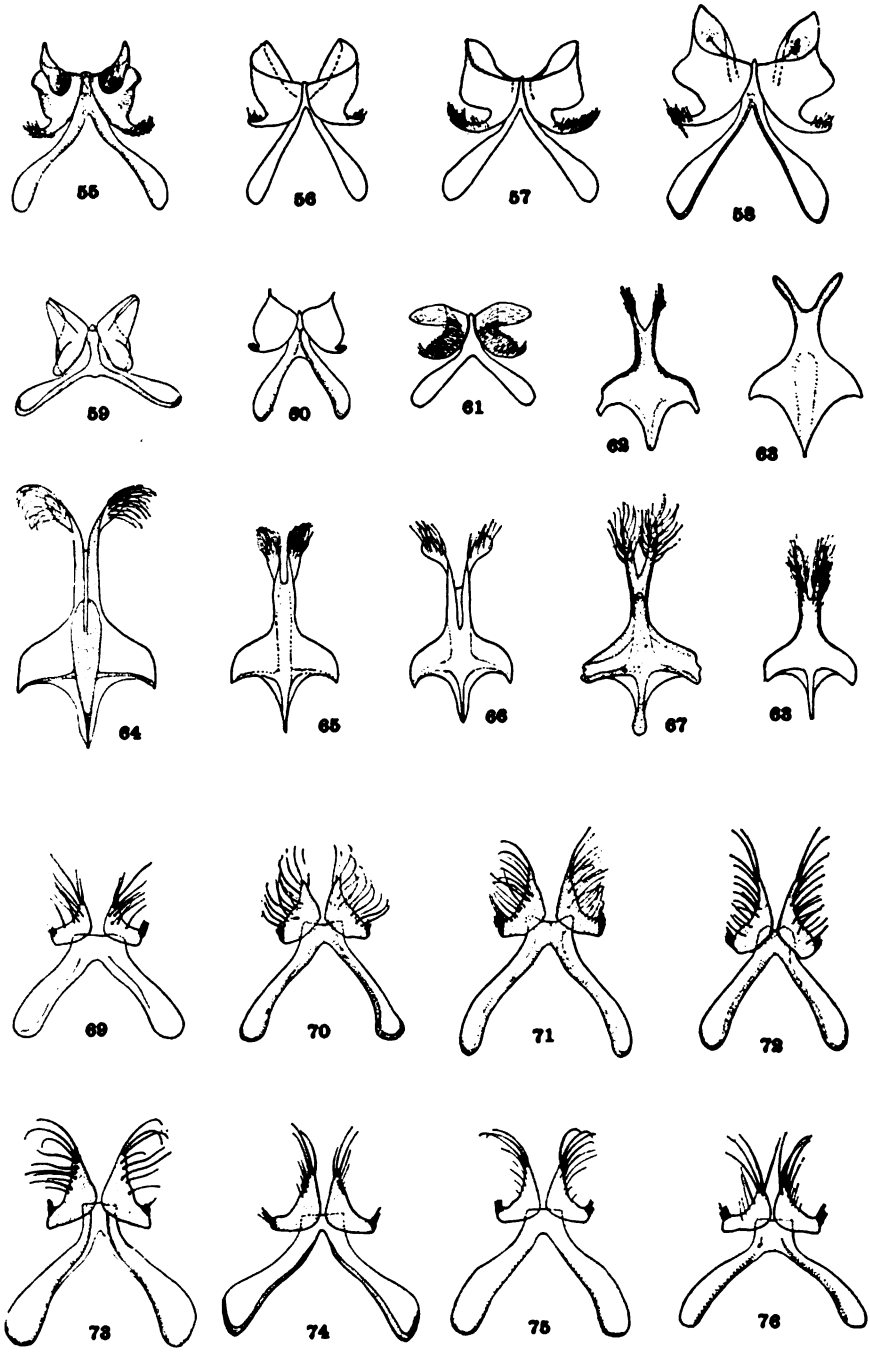

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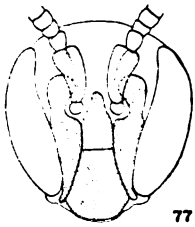
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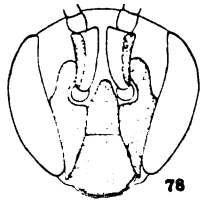
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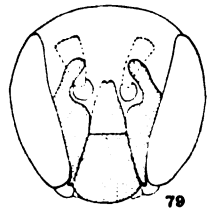
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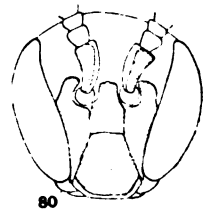
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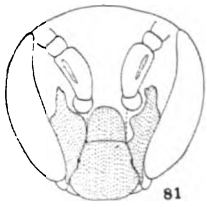
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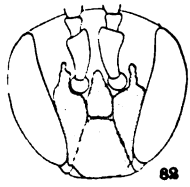
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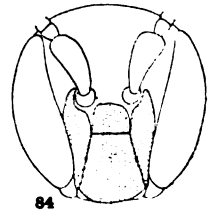
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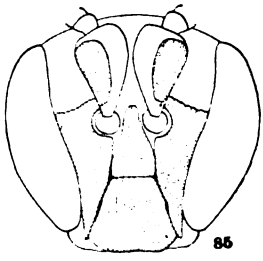
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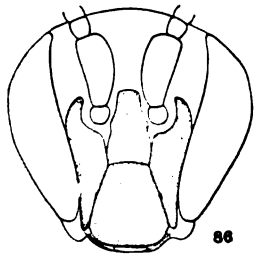
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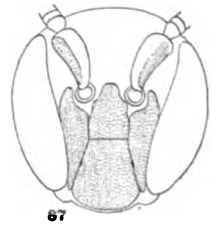
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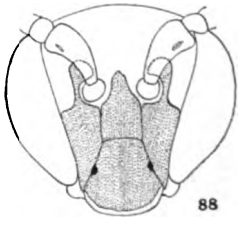
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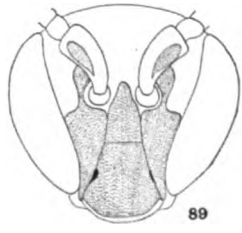
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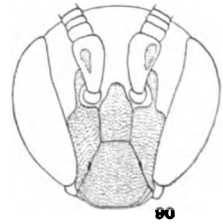
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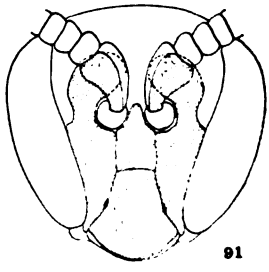
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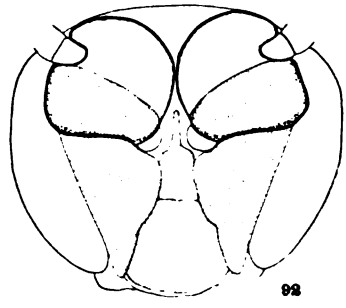
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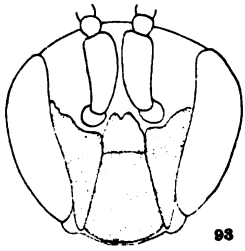
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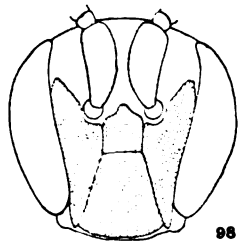
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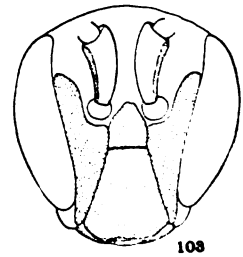
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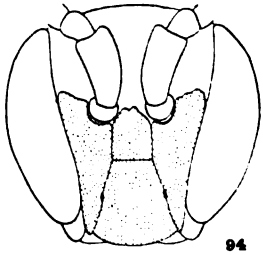
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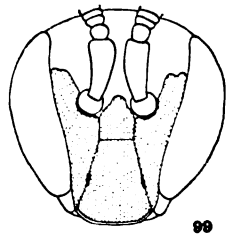
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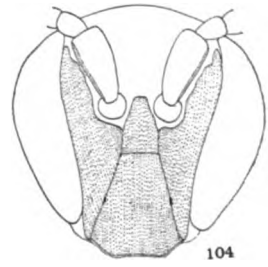
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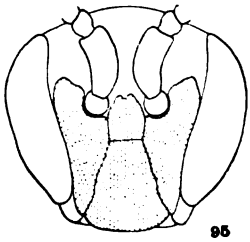
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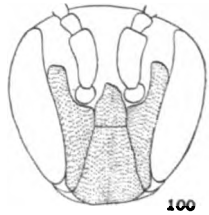
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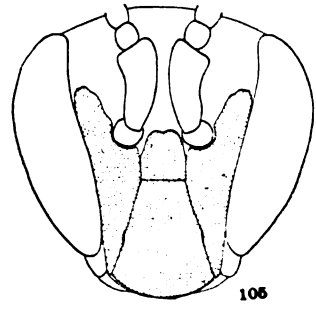
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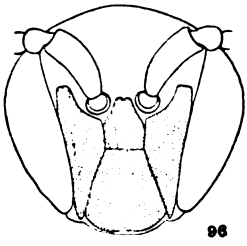
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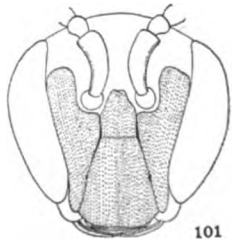
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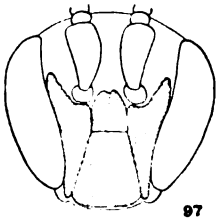
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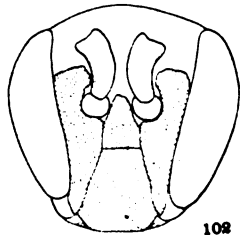
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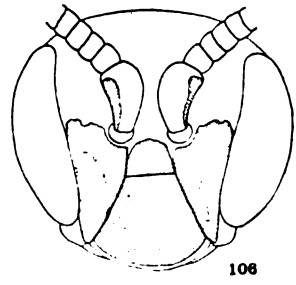
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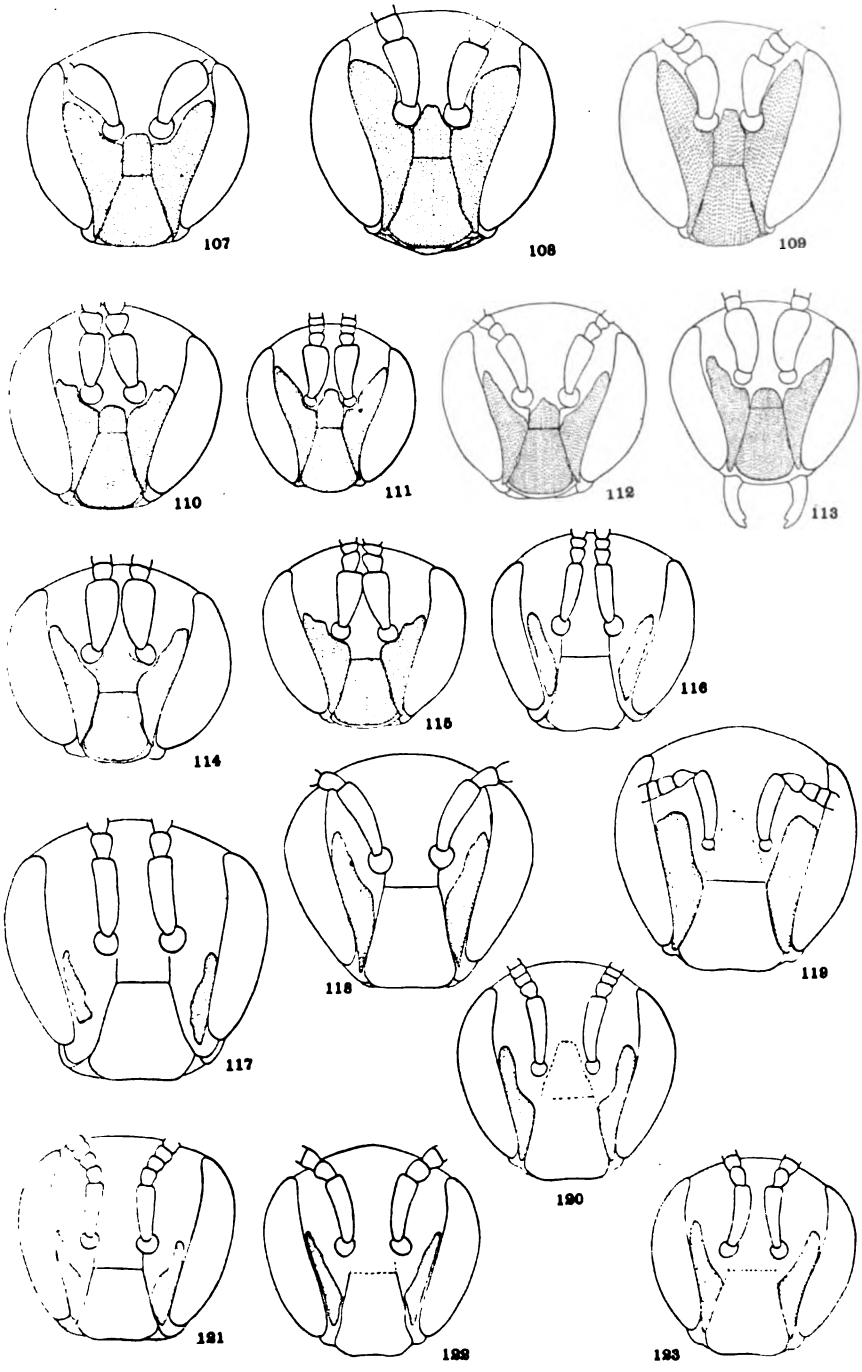

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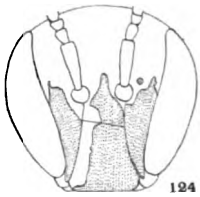
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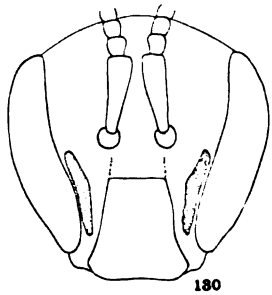
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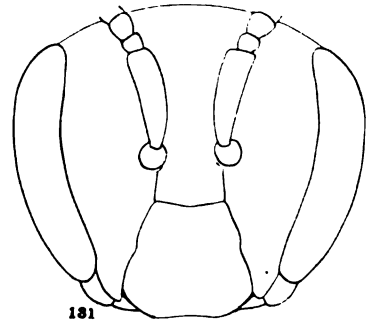
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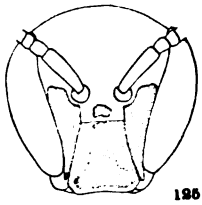
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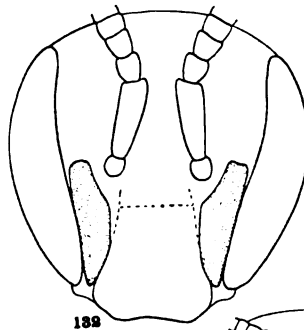
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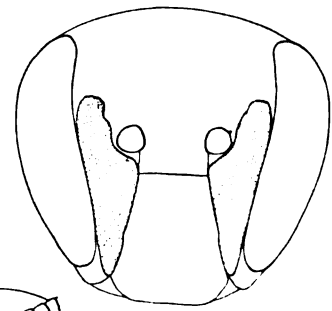
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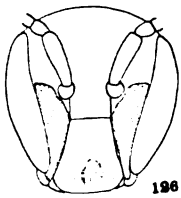
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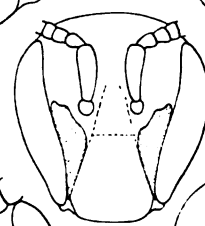
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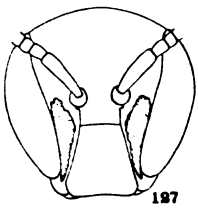
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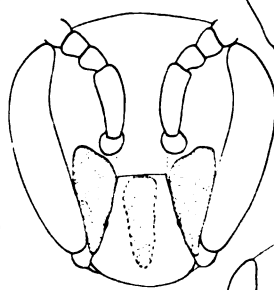
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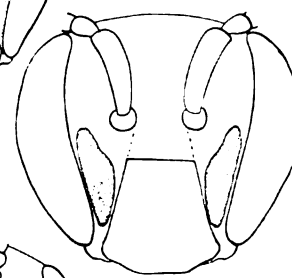
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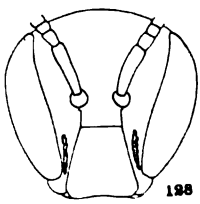
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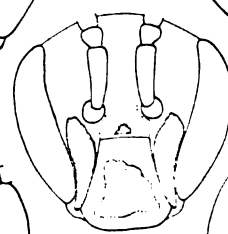
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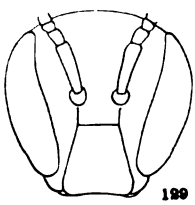
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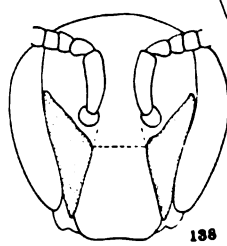
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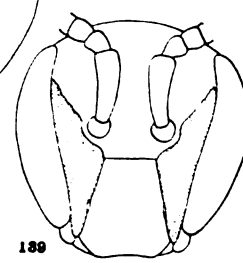
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SKINNER ON HESPERIDAE.

ALL FIGURES FIVE-SIXTHS NATURAL SIZE.

THERE SHOULD NOT BE ANY TINGE OF RED ON THE FIGURE OF BATABANO. THE HIND WINGS ARE BLUE-BLACK WITH A BAND OF BLUE SPOTS PARALLEL TO THE OUTER MARGIN.

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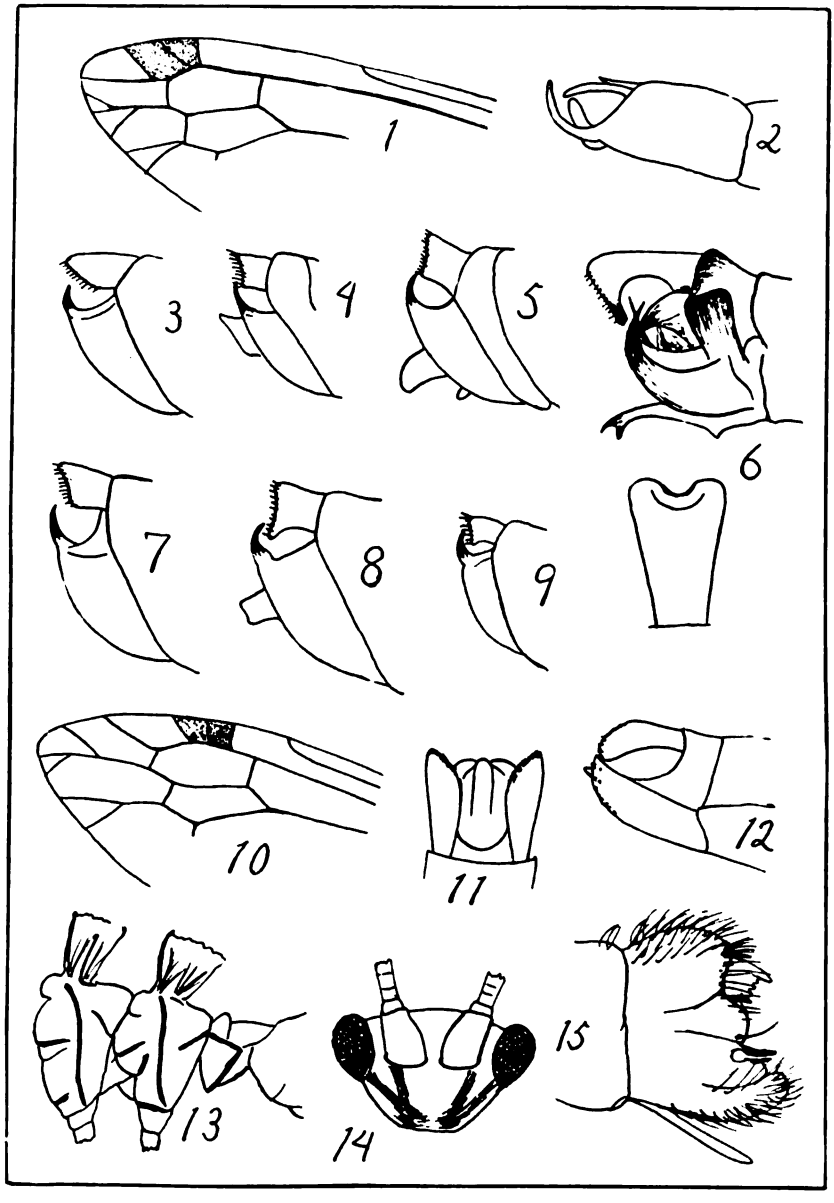

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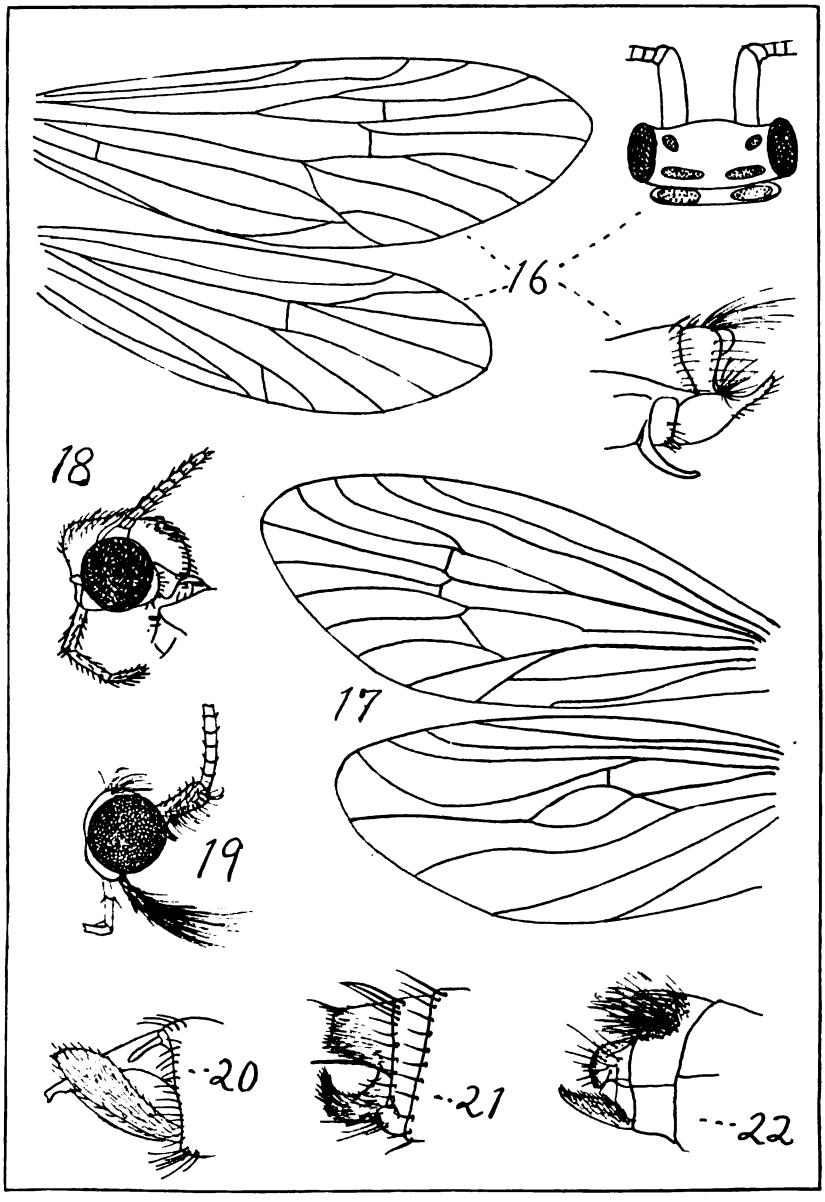

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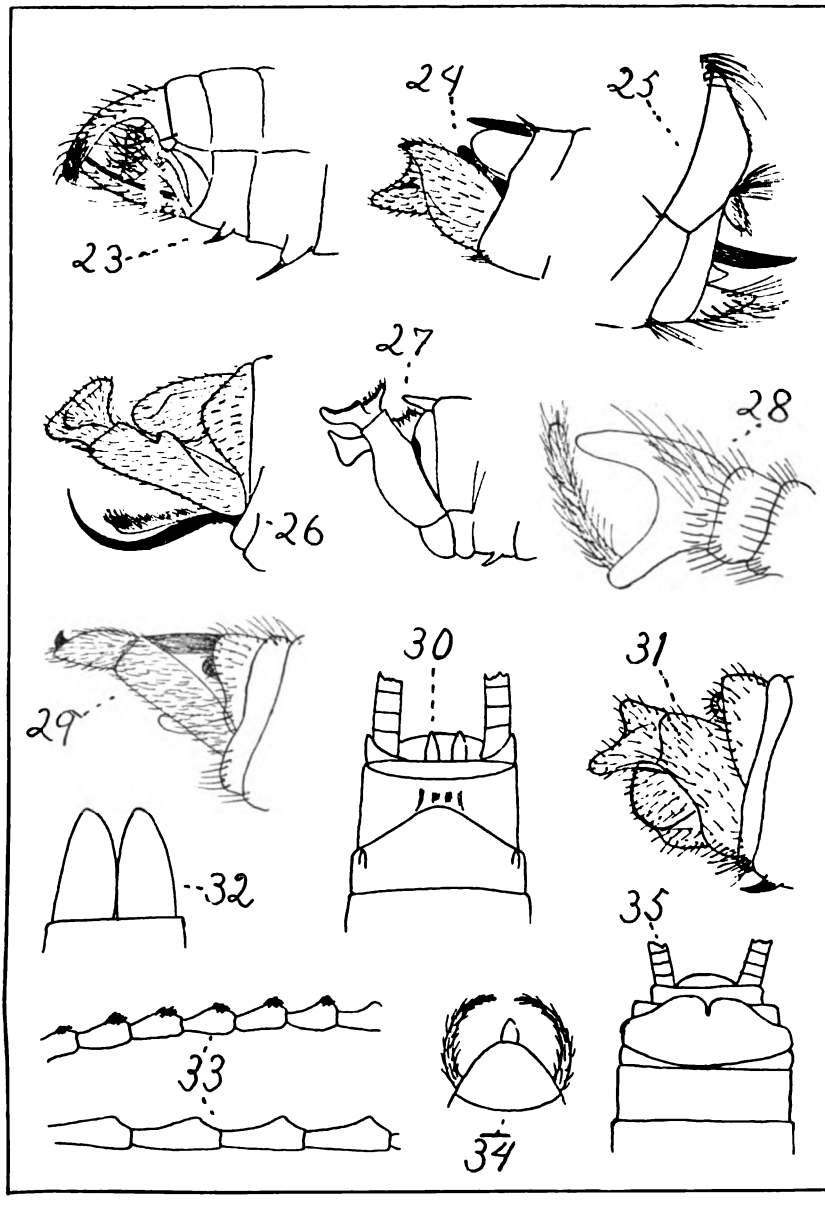

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